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Contents

- 1 Hospital Diversification Strategy**
Steven R. Eastaugh
- 14 Public Hospitals in Peril: Factors Associated with Financial Distress**
Zo Ramamonjiravelo, Robert Weech-Maldonado, Larry Hearld, and Rohit Pradhan
- 31 Using a Social Entrepreneurial Approach to Enhance the Financial and Social Value of Health Care Organizations**
Sandra S. Liu, Jui-fen Rachel Lu, and Kristina L. Guo
- 47 Health Care Reform and the Development of Health Insurance Plans: The Case of the Emirate of Abu Dhabi, UAE**
Samer Hamidi, Dr.PH, Sami Shaban, PhD, Ashraf A. Mahate, PhD,
and Mustafa Z. Younis
- 67 The Impact of Star Physicians on Diffusion of a Medical Technology: The Case of Laparoscopic Gastric Bypass Surgery**
Laura Shinn
- 86 Health Policies and Intervention Strategies**
Aliye T. Mosaad and Mustafa Z. Younis
- 101 Determinants of Differentials in Pneumonia Mortality in the UK and France**
Rizwan ul Haq, Patrick Rivers, and Muhammad Umar

From the Editor— About This Issue

Once again, this issue of the *Journal of Health Care Finance* is illustrative of the breadth of topics we cover.

We are always interested in new article ideas that directly or indirectly relate to health care finance. To submit ideas or articles, please send an email to: HealthFinanceJournal@yahoo.com.

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Hospital Diversification Strategy

Steven R. Eastaugh

To determine the impact of health system restructuring on the levels of hospital diversification and operating ratio this paper analyzed 94 teaching hospitals and 94 community hospitals during the period 2008–2013. The 47 teaching hospitals are matched with 47 other teaching hospitals experiencing the same financial market position in 2008, but with different levels of preference for risk and diversification in their strategic plan. Covariates in the analysis included levels of hospital competition and the degree of local government planning (for example, highly regulated in New York, in contrast to Texas). Moreover, 47 nonteaching community hospitals are matched with 47 other community hospitals in 2008, having varying manager preferences for service-line diversification and risk. Diversification and operating ratio are modeled in a two-stage least squares (TSLS) framework as jointly dependent. Institutional diversification is found to yield better financial position, and the better operating profits provide the firm the wherewithal to diversify. Some services are in a growth phase, like bariatric weight-loss surgery and sleep disorder clinics. Hospital managers' preferences for risk/return potential were considered. An institution life cycle hypothesis is advanced to explain hospital behavior: boom and bust, diversification, and divestiture, occasionally leading to closure or merger.

Key words: *product line selection, diversification, risk, operating profit margin, regulation*

Political leaders often promote comprehensive health system reform without any forethought into how it will impact organizations small and large. In this study we consider the largest of health care organizations, the hospital, and how shifts in government policy and local financial conditions impact diversification decisions. Diversification is a key strategy to support the core business, the inpatient hospital mothership, and a number of satellite service ventures. Interest in service product-line diversification is evidenced by the popularity of conferences and courses on hospital corporate planning and marketing. Diversification is a strategic management issue in the development of a marketing plan. For example, the basic way to build market share involves the development of more markets for current service, and more services for current markets. Many finance faculty argue that the hospital that fails to diversify will be relegated to a “plodder” or negative growth existence. The plodder is not positioned to benefit from insurance exchanges or value based purchasing (VBP).

Successful general hospitals are increasingly emulating specialty hospitals by placing focus on a narrow number of specialized departments. Specialty hospitals are emulating global business strategies for specialized “focus factories,” for example, China, South Korea, Japan, Italy, and Germany.¹ The hospitals, general and specialty, are increasingly selecting narrow posture decisions for what services to offer. For example, you might specialize in weight loss surgery or sleep disorders, and also select a trio-combo strategy like neonatal intensive care unit plus pediatric inpatient special unit plus organized

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pediatric outpatient department. In some highly uninsured states, Obamacare (the Affordable Care Act passed March 2010) might most significantly boost diagnostic testing volume.

Such market posture decisions typically precede marketing mix decisions. Poorly performing general hospitals often fixate on the initial posture decision stage, and do little new or different. Any attempt to have a general hospital emulate a general store may lead to strategic mediocrity. Hospitals make the choice about how broad or narrow a diversification effort should be made (posture decision), but almost never consider the strategic decision about whether to use a marketing penetration or market-skimming pricing strategy. Indeed, pricing decisions are less frequently discussed in the hospital sector relative to private industry because the consumer is so highly insured.²

Hospital boards realize that the recent growth in detailed restructuring plans must be tempered by concern for administrative costs. The better managed facilities do not just pursue imitative entry or “bandwaggoning.” For example, if CGH medical center goes into sports medicine we follow with a “me too entry” into the same service-line. Well managed hospitals analyze posture variables, and methods to offer a favorable degree of product differentiation relative to the competition. The situation gets “sticky” if the hospital begins to heighten preexisting levels of competition with their own physicians. The hospital, as a centralized service distribution innovator, has the potential to reduce the time-cost to physicians and the travel time-cost to patients in the provision of many health services.³

The new lines of business we will consider in this empirical study are all related ventures (that is, only expanding existing health product lines of service). Public image and profits often improve after a diversification expansion. Four teaching hospitals reported profitable diversification efforts providing dental care for the handicapped and alcohol detoxification and counseling services to teenagers. Obamacare expansion in the coming decade might expand such opportunities. Some services such as bariatric weight-loss surgery are in a growth period of development, while other services face maturation and decline. Today, any institution must collect enough retained earnings to render health services in the future and to rebuild and modernize facilities. The product portfolio of the hospital can be diversified to include health promotion and health education activities, such as programs designed to improve patient compliance.

The sample consists of 94 teaching hospitals and 94 nonteaching community hospitals in 12 states. Service-specific shifts in diversification are listed in Figure 1. The fastest growth area, bariatric weight-loss surgery, was added during the study period to 21 hospitals. Sleep disorder clinics have been added at 18 hospitals. The most disturbing trend is that 24 of the hospitals (Figure 1, Line 6) closed their emergency departments in the study period 2008–2013. No hospital opened an emergency room. In the last decade 945 US hospitals have closed their emergency department according to the American College of Emergency Physicians 2013.⁴ With the onset of the Affordable Care Act this trend towards closing emergency departments should slow or stop.

Figure 1. Service-Specific Changes in Hospital Diversification 2008–2013 (94 pairs of hospitals)

| Type of Service | Deletions | Additions | Net 5-Year Change |
|---|-----------|-----------|-------------------|
| Quality-enhancing services | | | |
| Diagnostic radioisotope facility | 3 | 7 | 4 |
| Blood bank | 1 | 5 | 4 |
| Histopathology laboratory | 1 | 3 | 2 |
| Premature nursery | 7 | 5 | (2) |
| Emergency department | 24 | 0 | (24) |
| Pharmacy with pharmacist | 5 | 8 | 3 |
| Complex services | | | |
| Neonatal intensive care unit | 4 | 5 | 1 |
| Computer-assisted detection mammography | 2 | 9 | 7 |
| Electroencephalography | 4 | 2 | (2) |
| Pediatric inpatient unit | 4 | 8 | 4 |
| Cardiac rehabilitation | 5 | 10 | 5 |
| Respiratory therapy department | 6 | 7 | 1 |
| Cardiac intensive care unit (CCU) | 4 | 9 | 5 |
| Dental Services | 4 | 8 | 4 |
| Laser optic treatment | 3 | 15 | 12 |
| Therapeutic radioisotope | 5 | 5 | 0 |
| Rehabilitation inpatient department | 6 | 12 | 7 |
| Psychiatric inpatient unit | 13 | 1 | (12) |
| Radium therapy | 5 | 3 | (2) |
| X-ray, therapeutic | 1 | 10 | 9 |
| Community services | | | |
| Bariatric weight-loss surgery | 0 | 21 | 21 |
| Podiatric services | 8 | 14 | 6 |
| Speech pathology services | 7 | 8 | 1 |
| Occupational therapy department | 5 | 8 | 3 |
| Skilled nursing or long-term care unit | 2 | 9 | 7 |
| Sleep disorder unit | 0 | 18 | 18 |
| Alcohol/chemical dependency outpatient services | 9 | 15 | 6 |
| Rehabilitation outpatient department | 7 | 7 | 0 |
| Inpatient hemodialysis | 7 | 8 | 1 |
| Physical therapy department | 6 | 12 | 6 |
| Clinical psychology services | 4 | 7 | 3 |
| Psychiatric outpatient unit | 14 | 12 | (2) |
| Psychiatric consultation and education services | 10 | 10 | 0 |

AU: Does this number (1) mean this calculation is step 1?

Background and Objectives

In this study, hospital diversification (DIV) is calculated as follows:

AU: What does this number (33) refer to?

$$(1) DIV = \frac{\text{No. of services available in the hospital}}{\text{Maximum Number of Services } (33)}$$

The central problem in modeling hospital diversification and its impact on the operating ratio is that the relationship is interdependent. For example, diversification might improve the operating ratio in a causal fashion, but the baseline operating ratio might be inversely proportional to the hospital's

perceived need to diversify. Conversely, a hospital might need a certain baseline operating ratio to afford to finance a diversification effort or to gamble. Diversification might also occur because of expectations for change in the operating ratio. In other words, the level of diversification and level of operating ratio are hypothesized to be jointly dependent or endogenous within the context of two simultaneous equations:

(2) Operating ratio, $M = f(\text{diversification, exogenous factors influencing market share, and reimbursement, disturbance term})$

AU: Does this (2) refer to the next step in the calculation?

(3) Diversification, $DIV = f(M, \text{exogenous factors impacting hospital competition, physician demand, payers demands to contain capital expansion, disturbance term})$

AU: Does this (3) refer to the next step in the calculation?

It is important to note that if we are to study the interdependent endogenous variables DIV and M , and a number of other exogenous variables ($I_1, I_2, \dots, I_7, I_8$), it would be inaccurate and misleading to study a typical multiple regression equation:

(4) $DIV = f(M, (I_1, I_2, \dots, I_6, I_7))$

AU: Does this (4) refer to the next step in the calculation?

In a simultaneous equation situation we are dealing with the regression of a set, or, in this case, a pair of dependent variables (DIV, M), regressed upon a set of independent variables. A simultaneous situation is:

(5) $(DIV, M) = f(I_1, I_2, \dots, I_6, I_7)$

AU: Does this (5) refer to the next step in the calculation?

The 188-hospital sample is matched by bed size, ownership, and teaching status. By pairing the hospitals, we hope that they may behave more nearly alike than do hospitals

less closely related. The situation is analogous to designing an evaluation of a new drug, in which patients whose prognosis appears to be about the same at the beginning of the study (2008) are paired. The 10 variables in the nearest available matching process⁵ are listed in Figure 2. The facilities experience a different dosage level of diversification over the study timeframe, but they start with the approximate same financial performance. The researcher asks how the operating ratio changed in response to changes in the dose of diversification. The analogy to the drug evaluation breaks down in one important respect: the hospitals are in control of their own dosage of diversification; that is, expansion is endogenous (within system control) within some exogenous (external, not predetermined by the hospital) regulatory and market constraints. Consequently, the evaluation design is similar to a pre-test/post-test situation. However, the hospitals are not in experimental isolation, and a number of other intervening variables must be monitored during the five-year period. The hope is that if one monitors all the market characteristics that could have an intervening effect ($IV_1, IV_2, IV_3, \dots, IV_m$), and if the matching process adequately captures other intrinsic characteristics (V_1-V_2), then the impact of diversification on operating ratio M can be measured as:

(6) $M = f(DIV, I_1, I_2, I_3, I_4, I_5)$

AU: What does this (6) number stand for?

The advantage of this approach, rather than collecting data to estimate a more-complicated regression equation, is that one need not worry about losing too many degrees of freedom in measuring attributes V_1-V_2 with I_{z+n} additional number of independent variables.

Figure 2. 10 Variables Used in the Nearest Available Matching of Hospitals into 94 pairs

| Variable Category | Variable |
|--|---|
| Diversification | DIV |
| Output severity | Percent families below poverty line Surgical intensity (operations per admission) Outpatient intensity (visits per patient treated) |
| Output complexity | Number of services in three increasingly complex categories in Figure 1 system of classification: Quality-enhancing services Community services Complex services |
| Financial health | M, operating ratio |
| Other institutional factors fixed in the short run | Hospital size Age of plant |

There are 10 basic hypotheses under consideration in our analysis. Because a hospital may need a sufficient operating margin to diversify and a diversification effort should improve the reimbursement portfolio (assuming one selects above-average areas in which to diversify) and consequently the operating margin, I hypothesize:

1.0 A non-recursive simultaneous model, where DIV is a function of margin M, and, further, M is a function of DIV. In our model DIV and M are endogenous, because they are to a large extent dependent on other variables in the system and under the control of management. (One could alternatively have postulated a recursive model, in which M does *not* directly or indirectly influence DIV, while DIV is an indirect or direct determiner of M. Instead we are testing the strength of a non-recursive model, in which in terms of a path diagram, M and DIV are allowed to form a closed loop.)

Given that the hospital pairs start the time period with the same approximate bed size, diversification (no pairs were more than 0.042 different in DIV), operating ratio (no pairs were more than 0.015 different in M), output complexity, output severity, plant age, and teaching affiliation status in base year 2008, I postulate that only three additional exogenous variables impact operating ratio M:

- 1.1 A positive influence of exogenous bed closings of neighboring hospitals on (increasing) the operating ratio of our paired sample hospitals.
- 1.2. A positive influence of the exogenous variable MCARE, the annual fraction of the county catchment area over 65, was postulated to have a positive influence on M.
- 1.3 Every variable in our analysis will be defined as the paired difference between paired hospitals. Conceptually, 94 hospital pairings producing 470 observations over the five-year study period is equivalent to 470 first

Au query: are outline numbers necessary? See later comments.

differences of logs. When matching hospital pairs, instead of having 188 observations with 10+m independent variables (where m is a very large number of additional variables needed to measure the constructs captured in the matching process, one is left with 470 observations and 5 to 6 variables per equation.

1.4 negative influence of the exogenous variable POOR, the annual fraction of the catchment area below the federal poverty line, is postulated to have a negative influence on M. This variable is taken as a proxy measure for the likelihood of bad debt.

The natural logarithmic specification (\ln) for the long-run operating ratio in year t , with a disturbance term u_t , equals:

$$(7) \ln M_t = \beta_1 \ln DIV_t + \beta_2 \ln E_t + \beta_0 + u_t,$$

where the set of exogenous explanatory variables (E) includes:

- BEDCLOSE = reduction in number of beds per capita in the catchment area since 2007;
- MCARE = fraction of population eligible for Medicare in the area;
- POOR = fraction of population that is poor; and
- T = time trend variable (2008 = 1, 2009 = 2, etc.).

There are five hypotheses associated with the second equation in our simultaneous model. The academic literature on diversification in the hospital field is rather uneven and anecdotal. The most universally mentioned variable in the recent literature is competition.⁶ One purpose for this study is to test the link between high competition

and increased diversification. The measure of noncompetition is the Herfindahl index, which summarizes the entire size distribution of firms in a market. The Herfindahl index can range from 1.0, by definition, for a natural monopoly situation (for example, a very rural hospital) to a low of 0.00 in our sample. Because the Herfindahl measure is an index of noncompetition, I hypothesize:

2.1 A higher Herfindahl index, as a proxy for less competition, will be associated with less diversification; that is, H should have a negative impact on DIV.

From a hospital manager's vantage point, the direction of change (increasing or decreasing) of this index for noncompetition may be more important than the absolute level of competition. One might postulate that the change in institutional pressures to diversify over time might depend more on the recent direction of change in the level of competition; that is, if competition is on the upswing, a manager might be less averse to risk and more likely to gamble on a diversification proposal. However, if the level of the competition is stable or declining, the manager may be less likely to gamble. In other words, the impact of our anti-competitive index H on DIV may vary as a function of whether H has been decreasing in the recent past. I hypothesize:

2.2 The coefficient for the H index is smaller and less significant when H has been declining (competition increasing) in the last two years, relative to the coefficient for H when the index has been stable or increasing. H is postulated to have a less negative influence on DIV when competition

AU: What does this (7) number refer to?

AU: Does this refer to the equation labeled (2), above?

AU: Why does this set of hypotheses start with 2.1 when the first set started with 1.0?

has been increasing (H declining), perhaps because the manager’s aversion to risk-taking would be diminished in the increasingly competitive environment.

A number of analysts have suggested that the exogenous pressures to diversify are generated, in part, from specialists.⁷ I hypothesize:

2.3 The ratio of specialist physicians per 10,000 population in the area has a positive impact on diversification.

The eighth hypothesis I wish to test is whether M has a differential impact on DIV, depending upon whether the financial position of the hospital is improving or not. The argument is somewhat analogous to hypothesis 2.2, in that if the hospital’s financial position is on the upswing, the manager might be less likely to take a gamble on a diversification proposal. This null hypothesis could be

labeled the “fat and happy” theory of “not rocking the boat” if the boat appears to be improving without further restructuring. I hypothesize:

2.4 The coefficient for M is smaller and less significant when M has been increasing in the last two years, relative to the coefficient for M when the operating margin has been stable or on the decline.

This hypothesis was suggested by hospital managers in the data collection process. The administrators managing consistently in the “bad year” (Figure 3, Column A) complained that the few hospitals able to run in the black (Figure 3, Column C) were the only hospitals that had the financial wherewithal to afford to diversify aggressively and consequently to improve or preserve M over time in an era of tight reimbursement. The last point suggests two final null hypotheses for inclusion in this analysis.

Figure 3. Operating Ratio (M) Trends for the Sample of 188 Matched Hospitals

| Year | Number of Matched Hospitals Operating Ratio (M) ^a | | | Median Value M |
|------|---|-------------------------------|---------------------|-------------------|
| | <0.985 (Bad Year) | 0.985–0.999 (Typical Year) | ≥1.0 (Good Year) | |
| 2008 | 66 | 41 | 81 | 0.999 |
| 2009 | 67 | 43 | 78 | 0.998 |
| 2010 | 76 | 40 | 72 | 0.994 |
| 2011 | 79 | 42 | 67 | 0.991 |
| 2012 | 80 | 43 | 65 | 0.990 |
| 2013 | 82 | 43 | 63 | 0.989 |

^a Operating ratio equals operating revenues divided by operating expenses, or 1.0 plus the operating margin. Bottom-line operating margins include nonoperating revenue in the calculation. Adding in nonoperating margins makes the average bottom-line margin 3.62 percent as of March 31, 2013.

AU: This may confuse some readers because the hypotheses are numbered 1.0, 1.1,...2.1, 2.2 It's easy to lose track of how many there are. Can they be numbered consecutively as 1, 2, 3?

AU:
Change
number-
ing? See
comment
14?

3.1 Time is postulated to have a negative impact on operating ratio M and a potential positive impact on the purely technology-driven component of diversification (DIV). The argument that hospital rate regulation reduced the average operating ratio has been well documented.⁸

3.2 Teaching status may interact with the management philosophy of the institution and consequently have an impact on the equation for DIV and M. Therefore, we will run the analysis for the entire sample and then rerun the analysis for the 47 pairs of hospitals that are teaching hospitals separate from the 47 pairs of hospitals that are nonteaching hospitals.

Data and Methods

All data are collected in the American Hospital Association annual survey. The American Hospital Association supported Barack Obama’s vision of health systems reform as early as 2008. The equation for DIV, differential diversification between pairs of hospitals is taken as a function of one endogenous factor (operating ratio = M) and four exogenous variables. To test the hypothesis that diversification is more a function of dM/dt, the change in financial status over time, we test the efficacy of creating two variables:

MUP = (−σ) (M) = operating ratio increasing

MSD = σM = operating ratio stable or decreasing

Where σ = 1.0 when $M_t < M_{t-1}$

The log-linear form will be used; thus, all the estimated coefficients represent short-term elasticity. The diversification equation has the following specification, in time t with disturbance term v_t :

$$(8) \ln \text{DIV}_t = \gamma_1 \ln \text{MUP}_t + \gamma_2 \ln \text{MSD}_t + \gamma_3 \ln F_t + \gamma_0 + v_t$$

AU: What
does this
(8) number
refer to?

in which the set of variables F includes:

- HDOWN = θH_t = competition increasing.
- HSG = $(1-\theta) (H_t)$ = competition stable or declining (where H = Herfindahl index, and $\theta = 1.0$ when $H_t < H_{t-1}$, otherwise $\theta = 0$).
- SPECMD = specialists in the catchment area per 10,000 population.
- T = time trend variable (2008 = 1, 2009 = 2, etc.).

The simultaneous system was estimated by means of two-stage least squares using diversification and exogenous market data from 2008–2013. The model was also estimated by means of ordinary least squares (OLS). I estimated regressions of the simultaneous relationship between DIV and M using pools of the time-series observations for 88 pairs of hospitals. Statistical investigation did not reveal any heteroskedasticity problems of changing variance in the disturbance terms.⁹ The Durbin-Watson test revealed no apparent problems of serial correlation in the error terms (autocorrelation). Multicollinearity is not much of a problem in the analysis, because only one item in the correlation matrix has an absolute value in excess of 0.41 (SPECMD and M are negatively related, $r = 0.463$).

The results for the operating margin equation are reported in Figure 4. Diversification

Figure 4. Estimated Operating Margin Equations for Teaching and Nonteaching Hospitals Under Two Estimation Methods: Single Equation OLS and TSLS, Normalized Variable $\ln M$

| Type of Hospital ^a | Estimation Method | \ln DIV | \ln BED-CLOSE | \ln MCARE | \ln POOR | T | Constant | R ² |
|-------------------------------|-------------------|--------------------|--------------------|--------------------|---------------------|---------------------|----------|----------------|
| Teaching | TSLS | 0.018 ^c | 0.018 ^c | 0.037 ^d | -0.090 ^b | -0.009 ^c | 0.010 | 0.861 |
| | OLS | 0.024 ^b | 0.020 ^c | 0.040 ^d | -0.091 ^b | -0.009 ^c | 0.011 | 0.844 |
| Non-teaching | TSLS | 0.017 ^c | 0.012 ^d | 0.030 | -0.079 ^b | -0.007 ^c | 0.004 | 0.831 |
| | OLS | 0.027 ^b | 0.012 ^d | 0.029 | -0.077 ^b | -0.007 ^c | 0.004 | 0.814 |
| All pairs | TSLS | 0.032 ^b | 0.028 ^b | 0.039 ^d | -0.093 ^b | -0.009 ^b | 0.009 | 0.892 |
| | OLS | 0.034 ^b | 0.028 ^b | 0.039 ^d | -0.092 ^b | -0.009 ^b | 0.009 | 0.880 |

^a The three clusters of hospitals have 243, 243, and 481 degrees of freedom, respectively.
^b Statistically significant at the 1 percent level.
^c Statistically significant at the 5 percent level.
^d Statistically significant at the 10 percent level, using appropriate t-test (See References, n.9.)

has its predicted positive impact on operating ratio, and this is statistically significant in all six cases. Moderate support is presented for hypotheses 1.1 and 1.2, in that the coefficients are positive for BEDCLOSE and Medicare variables, but results are only significant at the 0.10 level. Strong support is provided for hypotheses 1.3 and 3.1. There seems to be a steady deterioration in the operating ratio under the influence of the payment system, consistent with reports that hospitals are facing barebones reimbursement.¹⁰

In our sample, the -0.007 negative impact on M per year can be compensated for by $+0.0028$ per new service added. This suggests that diversification is one means to compensate for increasingly tight reimbursement. Another analysis, using this same sample of hospitals, indicates that the downward impact on M can be equally compensated by $+0.0031$ gain in department labor productivity.¹¹ In other words, limited diversification and productivity enhancement can, when done together, compensate for declines in M caused by payers.

The results for the DIV equation, excluding the statistically insignificant T variable

(rejecting hypothesis 3.1), are reported in Figure 5. Hypothesis 2.1 is supported, as a larger Herfindahl index is associated with less diversification. However, the negative impact of H on DIV was not statistically significant for the 35 percent of cases in which competition was increasing (HDOWN), strongly supporting hypothesis 2.2. All else being equal in the equation, the 56 percent of hospitals not experiencing an increase in competition (HSG) were able to avoid adding two new services in the five-year period relative to the other facilities (HDOWN, competition up). Needless to say, neither the popular nor the economic concept of competition is adequately represented by the H index, but the results are suggestive. The impact of declining H or increasing DIV is approximately equivalent in teaching and nonteaching hospitals. It might be speculated that as the hospital industry's noncompetitive position subsides in a neighborhood, contrary to hypothesis 3.2, the managers of teaching and nonteaching hospitals are equally willing to take risks to maintain (or improve) financial position and market position.

Figure 5. Estimated Diversification Equation for Teaching and Nonteaching Hospitals Under Two Estimation Methods: Single Equation OLS and TSLS, Normalized Variable \ln DIV

| Type of Hospital ^a | Estimation Method | \ln MUP | \ln MSD | \ln HDOWN ^e | \ln HSG | SPECMD | Constant | R ² |
|-------------------------------|-------------------|--------------------|--------------------|--------------------------|---------------------|--------------------|----------|----------------|
| Teaching | TSLS | 0.799 ^c | 0.812 ^c | -0.059 | -0.702 ^c | -0.124 | -0.014 | 0.815 |
| | OLS | 0.790 ^c | 0.819 ^c | -0.061 | -0.697 ^c | -0.119 | -0.010 | 0.802 |
| Non-teaching | TSLS | 0.721 ^c | 2.248 ^b | -0.082 | -0.629 ^c | 0.270 ^d | -0.020 | 0.762 |
| | OLS | 0.719 ^c | 2.419 ^b | -0.079 | -0.637 ^c | 0.272 ^d | -0.018 | 0.751 |
| All pairs | TSLS | 0.758 ^c | 1.601 ^b | -0.069 | -0.678 ^c | 0.109 | -0.016 | 0.821 |
| | OLS | 0.756 ^c | 1.675 ^b | -0.070 | -0.711 ^b | 0.104 | -0.014 | 0.810 |

^a The three clusters of hospitals have 241, 241, and 479 degrees of freedom, respectively.
^b Statistically significant at the 1 percent level.
^c Statistically significant at the 5 percent level.
^d Statistically significant at the 10 percent level.
^e H (Herfindahl index) declining means competition is increasing, whereas HSG stable or growing implies that competition is stable or declining.

There is little support for hypotheses 2.3. Consistent with the finding in hypothesis 3.2 is the finding that hypothesis 2.4 is only supported in the case of nonteaching hospitals. Surprisingly, the inverse of postulate 2.4 appears to be operating in the case of teaching hospitals. That is, teaching hospital managers only gamble on diversification if they are experiencing improved financial health (M increasing), but nonteaching hospital managers are more willing to gamble on diversification if their operating ratio is stable or declining. Nonteaching hospital managers are less concerned with whether they are “fat and happy” (high M) relative to the other sample hospitals. Further research is needed to ascertain the differences between the three types of hospital management concerning risk aversion and preferences for what services are best for diversification.

Discussion and Conclusions

At a time when hospital management is becoming more complex, market mix and

diversification decisions are critical. Competition is often promoted as a force that increases diversification. An army of lawyers and consultants are available in all states to sell hospitals on a diversification plan. The plan is sometimes developed on a “turn-key” basis (that is, all hospitals get approximately the same strategy advice with only marginal changes in where to diversify). Some naive hospital managers buy the “unique” plan of the more unscrupulous (atypical) consultants: “diversify; it’s fail-safe, and you cannot help but make money.” Such administrators would do well to study the failure rate of diversification programs in industry. Not enough hospitals do a complete analysis of future patient volume, cash flows, overhead, fixed start-up costs,¹² and the potential political and economic problem of undermining existing programs and clinics. Diversification is often sold with a simple qualitative argument that the more diverse the product line, the greater the number of affiliated physicians and, therefore, the greater the demand for each of the hospital’s services.

One might speculate that small-scale gambles with diversification require less-than-average managerial patience to see the project to conclusion because the maximum regret (loss) is low, and large-scale gambles may require less-than-average patience because the initial commitment has been so large that management fears the long-run consequences of timidly “cutting out losses” and pulling back on diversification (retrenching). As more financially distressed firms continue to take more risks, this will reconfigure the historic association between risk and return. Future researchers should explore whether hospital trustees, bolstered by rising consumer demand for care, seek to build a more-balanced corporate portfolio of service offerings.

Health care is the largest sector in the US economy, approaching 19 percent of gross domestic product (GDP). Risk is the critical issue for all sectors in our economy. Excessive risk selection has been called into question for bankers and large investors in recent years. The quantitative results of this small study must be regarded as tentative. However, the results suggest a potentially interesting interaction between planning, diversification, and competition. The financial ability and desire of a hospital to diversify might change by fits and starts. Hospital diversification behavior may be controlled by two conflicting motivations, growth and retrenchment. Some hospitals face the risk of having over-diversified and reducing service-lines and departments. Conversely, other managers may believe that “things must get worse before they can get better” and move into newly vacated markets as they poach enhanced market-share. The subject of manager risk selection and co-specialization of complementarities is a popular topic in the burgeoning field of organizational theory and behavior.¹³

The evolving preference for salaried positions among younger physicians is changing the hospital medical staff dynamic. One element missing from my study is the manner in which physicians interact with management and trustees. If the major hospital serving the poor was to close in a small city or town, one could imagine a range of responses. In our area one hospital acted as a conservative *status quo* “defender.” A second hospital in the area was characterized as the experimental playful “prospector” hospital willing to make small-scale gambles to improve their bad financial position. The third hospital labeled itself as an “entrepreneurial-analyst” firm willing to make only a few large-scale commitments to new market niches and sheltering their substantial financial reserves.

Future research should explore whether the hospital-based physician community splits into two basic divisions: (1) the diagnostic division containing equal numbers of prospectors and defenders; and (2) the therapeutic division consisting of a multitude of defenders and a few entrepreneurial analysts willing to “convince management to make that one big-scale bet.” The hospital that grows through 2025 may be the institution with the vision to follow the entrepreneurial analysts into health promotion, geriatric daycare, home health care, and service delivery keyed to particular human problems, such as alcoholism, hypertension, marital dysfunction, and eating disorders.

The odds against diversification are high in many regulated markets. Indeed, some hospitals in moderately good financial health relative to their neighbors will find the odds for success in broadly diversifying are unattractive. For the financially well-managed or financially destitute institution teetering on the edge of a catastrophe, the

AU: Is there a word missing here? The previous phrase used “managerial patience.” It’s not clear when referring to the large-scale gambles who has to be patient.

AU: Do you mean that hospitals have overdiversified so they must reduce service lines and departments to cut costs? This sounds as though reducing service is part of overdiversifying.

urge to gamble a little or a lot, respectively, may lead to diversification of services. In the first case, the management and trustees might be more interested in “having some fun” and “doing some good” by building a balanced corporate portfolio of service offerings. In the second case, the management might have to convince the trustees that “if we want to stay afloat in this regulated environment, we better find some money-making service areas to subsidize our money losers.” Incentive bonus compensation plans are one way to assure that the hospital sector can attract high-quality risk takers. Private hospitals initiated pay-for-performance (P4P) payment incentives 20 years before the current Medicare P4P program. Forward-thinking managers will consider diversification and a productivity-enhancement P4P internal payment formula to improve the hospital’s financial position. Managers that reposition their service product-line mix, and adjust incentives, will capture market share.

Most hospital managers believe that competition prompts diversification. The picture is most complex when one factors in financial health and institutional capacity. A hospital with a good operating margin can either breed complacency because lack of

necessity impedes innovation or breed rapid diversification because the operating margin provides the venture capital for the hospital to experiment. In a dynamic situation, the first derivative of competition (increasing or decreasing) and financial health (improving or deteriorating) may be more crucial to the diversification issue than the absolute level of either competition or financial health.

The hospital is an important civic enterprise in our society. Hospitals with broad and lateral interests in the health and well-being of their consumers are likely to grow through diversification into other medical arenas rather than expand into unrelated lines of business. The popularity of hospital restructuring plans has to be tempered by concern for direct and indirect administrative cost. Hospitals that place too much faith in short-run financial strains might profit from observation of the retail sector. Over-reliance on retrenchment (closure of product lines) can drive the organization into the ground. In 2012 an Apple executive (Ron Johnson) took over as CEO of J.C. Penny, closed 30 percent of product lines (khaki pants and pantyhose, for example), and was fired when revenues declined 22 percent. Retrenchment to finance high-brow diversification can cost the CEO his job.

REFERENCES

1. Eastaugh, S, “Hospital Cost and Specialization,” *Journal of Health Care Finance*, 35(4):26–32 (2011).
2. Eastaugh, S, “Response to Market Reform,” *International Journal of Applied Economics*, 8(1):1–16 (2011).
3. Feldstein, M, *Hospital Costs & Health Insurance*, Cambridge, MA: Harvard (1999).
4. ACEP, American College of Emergency Physicians, *ACEP Annual Survey of Hospital Emergency Departments*, Washington, DC: ACEP (2013).
5. Eastaugh, S, *Health Care Finance and Economics*, Sudbury, MA: Jones and Bartlett (2006).
6. Brekke, K, Cellini, R, “Competition and Quality in Health Care Markets,” *Journal of Health Economics*, 29(4):508–523 (2010).
7. Courtemanche, C, “Does Competition Affect Hospital Output,” *Journal of Health Economics*, 29(5):765–773 (2010).

8. Eastaugh, S, "Hospital Productivity and Information Technology," *Journal of Health Care Finance*, 36(4):27–37 (2010).
9. Maddala, G, *Introduction to Econometrics*, New York: Macmillan (2000).
10. Greenspun, H, Bercik, W, "Cost-outcomes Focus is Essential," *Healthcare Financial Management*, 67(2):96–102 (2013).
11. Eastaugh, S, "Health Information Technology Impact on Productivity," *Journal of Health Care Finance*, 39(2):64–80 (2012).
12. Eastaugh, S, "Total Cost," *Healthcare Financial Management*, 67(2):66–71 (2013).
13. Clark, J, Huckman, R, "Specialization in the Hospital Industry," *Management Science*, 58(4):708–722 (2012).

Public Hospitals in Peril: Factors Associated with Financial Distress

Zo Ramamonjiarivelo, Robert Weech-Maldonado, Larry Hearld, and Rohit Pradhan

As “safety net providers,” public hospitals have played a major role in health care delivery, especially in serving the indigent and the uninsured. For several decades, public hospitals have been operating in a challenging environment, and some of them have experienced financial difficulties. The purpose of this study was to explore the organizational and environmental factors associated with public hospitals’ financial distress. This study used a national sample of public hospitals based on longitudinal panel data from 1997 to 2009, resulting in a sample size of 7,257 hospital-year observations. The Altman Z-score method was applied to assess hospitals’ financial condition. The significant findings from a random-effects logistic regression model with state and year fixed-effects indicated that higher Medicare HMO penetration was associated with financial distress. Organizational variables such as health network, size, occupancy rate, and outpatient mix decreased the odds of financial distress; and membership in a multihospital system increased the odds of financial distress.

Key words: *financial distress, public hospitals, Altman Z-score, munificence, dynamism, complexity*

Public hospitals play an important role in the health care delivery system. The principal mission of public hospitals is to provide healthcare for the indigent, the needy, and the uninsured; therefore, they act as the “provider of last resort” or “safety net” for the community.¹ In 2008, approximately 25 percent of patients served by public hospitals were Medicaid patients compared to 17 percent for private, not-for-profit hospitals. In addition, public hospitals provided more care for the uninsured (8 percent) compared to private not-for-profit hospitals (5 percent).² Furthermore, 16 percent of public hospitals’ operating costs in 2009 were uncompensated relative to 6 percent of operating costs of all hospitals in the United States.³

Although public hospitals carry the heaviest burden in serving some of the most vulnerable populations,⁴ they have the least operational flexibility. Public hospitals rely largely on the availability of funds from government entities, which may decrease sharply during economic crises. Furthermore, they have limited ability to raise additional funds from the capital markets.

Consequently, some public hospitals have experienced financial distress resulting in acquisitions by other hospitals, ownership status conversions, and even closures.⁵ As such, the number of US public hospitals declined from 1,761 to 1,105 (35 percent decline) between 1975 and 2008.⁶

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Conceptually, a firm can be considered in financial distress when there is a high risk of bankruptcy or failure, or when “the liquid assets of the firm are not sufficient to meet the current requirements of its hard contracts.”⁷ Hard financial contracts refer to the firm’s obligations to its creditors such as bondholders, suppliers, and employees.⁸ There is no agreed-upon operational definition of financial distress. Most prior studies have used multiple financial ratios in assessing financial distress or bankruptcy/failure risk.⁹ McCue defined financial distress as having both an average negative cash flow to total beds (cash flow ratio) and negative net income to total beds (profitability ratio) over a two-year period.¹⁰ Kim defined financial distress as having a negative financial strength index (FSI), based on a hospital performing worse than the industry median on four financial indicators: total margin, days cash on hand, percent debt, and age of the physical facility.¹¹

Relatively few studies have used empirically derived thresholds to determine financial distress of hospitals. Bazzoli and Andes, based on a three-year average, identified financially distressed hospitals as those with at least six of eight financial ratios below the median of hospitals with a BBB credit rating, which implies a high risk for bond default.¹² On the other hand, Langabeer¹³ examined the financial distress of teaching hospitals using the Altman’s Z-score model,¹⁴ empirically derived using multiple discriminant analysis of the bankruptcy of service and retail firms.

The purpose of this study is to investigate the impact of environmental and organizational factors on public hospitals’ financial distress, using a more comprehensive measure of financial distress. Because public

hospitals are open systems that interact with and are affected by their external environments, it is important to include both organizational and environmental factors in the prediction of financial distress.¹⁵

This study contributes to the hospital financial distress literature in several ways. First, this is the first empirical study that examines the impact of both organizational and environmental factors on public hospitals’ financial distress based on a nationally representative sample and longitudinal data. Studying financial distress of public hospitals is important given the unique operating and financial environment faced by this group of hospitals. As such, this study can provide important managerial and policy insights. Second, this is the first study of public hospitals’ financial distress applying the Altman Z-score model. This model has been widely used in the finance literature to determine financial distress, and it is calculated based on a weighted composite score of four financial ratios: liquidity, financial leverage, profitability, and capital structure ratios. Thus, it takes into account “the interrelationships of many different financial aspects, similar to that of a balanced scorecard.”¹⁶

Conceptual Framework and Hypotheses

This study applies the resource dependence theory (RDT), which posits that “the key to organizational survival is the ability to acquire and maintain resources.”¹⁷ Resources are viewed as the inputs that organizations need to produce outputs and the environment refers to the “organization’s source of inputs and sink of outputs.”¹⁸ In other words, the focal organization’s environment includes other

entities from which it acquires resources and to which it sells products and services. This definition implies that organizations are neither self-sufficient nor self-reliant;¹⁹ however, the availability of resources is uncertain. Uncertainty is one of the characteristics of the environment, and it refers to the fluctuation of resource availability and the magnitude of challenges the organization faces in acquiring key resources.²⁰ Thus, scarcity of resources, combined with their uncertain supply, makes resource acquisition a critical element to organizational survival.

In addition, RDT posits that organizations seek to maximize their power and independence relative to other organizations by acquiring critical resources. Organizations can survive in their environment as long as they obtain access to resources. As a result, organizations are not passive, they can transform the environment; the various strategic moves that organizations undertake to acquire resources will change the environmental landscape.²¹ Three dimensions of the external environment have become commonly used in empirical studies: environmental munificence, environmental dynamism, and environmental complexity.²²

Environmental Munificence

Environmental munificence refers to the abundance of resources in the environment to support the operational needs of organizations. Munificence has been operationalized as per-capita income, overall population growth, growth rate of the elderly population, growth in total sales, growth in total employment, and the number of physicians in the county.²³

Prior empirical studies have found that hospitals operating in more munificent environments have better financial performance. Munificence, defined as the proportion of people aged 65 and older in the hospital's market, was found to have a positive association with financial performance.²⁴ Additionally, Kim found that environmental scarcity in terms of a high unemployment rate increased the probability of financial distress among hospitals located in metropolitan statistical areas (MSAs).²⁵

Organizations operating in more munificent environments tend to exhibit higher financial performance because they have greater access to resources. As a result, organizations can focus their efforts on increasing productivity, rather than spending resources to acquire other resources. Therefore, we hypothesize that:

Hypothesis 1: Public hospitals operating in more munificent environments are less likely to experience financial distress than public hospitals operating in less munificent environments.

Environmental Dynamism

Environmental dynamism is the extent to which changes in the environment are unpredictable and occur more frequently.²⁶ In health care, such changes include technological change, rapid growth in the size and number of organizations operating in the same industry,²⁷ and changes in regulations and policies. For example, the dynamism of the health care environment may be affected by the uncertainties with respect to the implementation of the Patient Protection and Affordable Care Act (PPACA) of 2010.²⁸

Prior studies have found that firms operating in more dynamic environments exhibit worse financial performance compared to those operating in more stable environments.²⁹ The high rate of change associated with dynamic environments can affect the process of planning and resource acquisition. Furthermore, the fluctuation of resource supply due to environmental change makes it more difficult to acquire resources. Therefore, we hypothesize that:

Hypothesis 2: Public hospitals operating in more dynamic environments are more likely to experience financial distress than public hospitals operating in more stable environments.

Environmental Complexity

Environmental complexity refers to the level of heterogeneity.³⁰ An environment is heterogeneous when it contains a large number of different types of entities that the focal organization needs to interact with to acquire resources.³¹ Prior studies have found that higher environmental complexity is associated with lower financial performance.³² Brecher and Nesbitt found that higher competition was associated with lower financial performance among not-for-profit hospitals in New York.³³ Similarly, Kim reported that higher environmental complexity, in terms of higher competition and greater HMO penetration, was associated with increased financial distress among private not-for-profit hospitals.³⁴

When there are many organizations in the same industry that compete for the same key resources, it is more difficult to acquire these resources. In addition, competing for key resources requires the consumption of other resources that could have been used

to increase the organization's efficiency and productivity, if the environment was less complex. Therefore, we hypothesize that:

Hypothesis 3: Public hospitals operating in more complex environments are more likely to experience financial distress than public hospitals operating in less complex environments.

Organizational Size

Organizational size has been found to be positively associated with financial performance.³⁵ Similarly, larger hospitals have been found to have lower risk of financial distress compared to smaller hospitals.³⁶

Larger organizations can reduce costs through economies of scale.³⁷ Furthermore, larger organizations may have greater bargaining power over suppliers, which can result in lower supply costs.³⁸ In addition, large organizations are able to accumulate slack resources, which firms can set aside for future environmental challenges.³⁹ Therefore, we hypothesize that:

Hypothesis 4: Larger public hospitals are less likely to experience financial distress than smaller public hospitals.

Teaching Status

Although teaching hospitals generally operate in complex environments and often have to provide higher amounts of uncompensated care, affiliation with a medical school may confer several benefits. Hospitals affiliated with medical schools have the reputation of providing higher quality care for complex procedures. Furthermore, they deliver highly specialized services and are well respected in their communities.⁴⁰

In many cases, teaching hospitals have a monopoly of ground breaking technology to treat specific conditions.⁴¹ Good reputation and a monopoly of sophisticated procedures have permitted teaching hospitals to charge fees up to 10 percent higher than nonteaching hospitals.⁴² Besides, teaching hospitals oftentimes have larger endowment funds than nonteaching hospitals,⁴³ which can serve as financial protection against adversities. Tennyson and Fottler⁴⁴ and Younis and Forgione⁴⁵ found that teaching status was associated with higher financial performance. Therefore, we hypothesize that:

Hypothesis 5: Teaching public hospitals are less likely to experience financial distress than nonteaching public hospitals

Methods

This study used longitudinal panel data from 1997 to 2009 of US public hospitals.

Data Sources

Four data sources were used: (1) the American Hospital Association (AHA) Annual Survey, (2) the Bureau of Health Profession's Area Resource File (ARF), (3) the Medicare Cost Report (MCR) from the Centers for Medicare & Medicaid Services, and (4) the Local Area Unemployment Statistics (LAUS) from the Bureau of Labor Statistics. The AHA data file contains organizational information such as ownership status, number of hospital beds, teaching status, multihospital system affiliation, and information with respect to the number of clinical and nonclinical staff. The ARF data file contains demographic and economic information on counties. The MCR data file contains financial data; it is

the most validated and widely accepted data for hospital financial analysis.⁴⁶ The LAUS data file contains estimates of monthly and annual averages of total employment, total unemployment, and unemployment rates at various geographical levels including metropolitan areas, cities, census regions and divisions, as well as counties.

Sample

This study used a national sample of government, nonfederal, acute care, general, and surgical hospitals in the US. To derive the analytic sample, several exclusion criteria were applied. First, hospitals that were either converted to a skilled nursing facility (N= 6), an ambulatory care facility (N=1), or a critical access hospital (CAH) (N=520) were excluded. Since CAHs have a different reimbursement policy, it was deemed appropriate to exclude them for this study. Second, we excluded hospitals that were acquired or merged (N=9) during the study period. Third, hospitals without complete financial reports during certain years of the study period were excluded from the analytic sample (N= 43). Therefore, the final analytic sample consisted of 608 public hospitals with a total of 7,257 hospital-year observations.

Variables

The dependent variable was dichotomous (1 = yes; 0 = no) that indicates whether a hospital is in financial distress in a given year. Financial distress is an indicator of the financial health of the hospital, and it can be used to predict the likelihood of a hospital meeting its debt obligations. The Altman Z-score model, designed to detect financial distress, was used to determine whether a public hospital was in financial distress.⁴⁷ For this study, the Altman Z-score model

designed for service and retail firms applied in Langabeer⁴⁸ was used to estimate public hospitals' financial condition. The discriminant function is formulated as follows:

$$Z = 6.56 X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

where:

X_1 = Net Working Capital / Total Assets

X_2 = Net Assets / Total Assets

X_3 = Excess Revenue over Expenses / Total Assets

X_4 = Fund balance / Total liabilities

X_1 is defined as the ratio of net working capital to total assets, and it is a measure of liquidity. Net working capital is defined as the difference between current assets and current liabilities. Altman⁴⁹ suggests this ratio is the most valuable liquidity ratio relative to the current ratio and quick ratio.

X_2 was originally defined as the ratio of retained earnings to total assets, and it is a measure of financial leverage. This study used net assets (total assets minus total liabilities) instead of retained earnings, given that public hospitals do not accumulate earnings from prior years. It measures the extent to which one dollar's worth of total assets is financed by debt and net assets, respectively. Higher net assets to total assets ratio means that the hospital has more assets than debts.

X_3 was originally defined as the ratio of earnings before income taxes to total assets, and it is a measure of both profitability and productivity of the firm assets.⁵⁰ Since public hospitals do not pay taxes, this study used excess revenue over expenses, defined as total revenues minus total expenses, in place of earnings before income taxes. This ratio measures how much profit a hospital makes out of one dollar worth of total assets.

X_4 was originally defined as the ratio of book value of equity to the book value of debt. This ratio represents the capital structure of the hospital; it is the extent to which the assets are financed by debt and equity, respectively. Public hospitals do not have equity, but the book value of equity or fund balance can be derived by subtracting total liabilities from total assets. In this study, X_4 is defined as the ratio of total fund balance to total liabilities.

Following Langabeer's approach,⁵¹ we classified a hospital as being in financial distress if its Z-score is less than 1.1; the hospital is not in financial distress if its Z-score is greater than 1.1. Independent variables include environmental munificence, environmental dynamism, environmental complexity, size, and teaching status.

Environmental munificence (hypothesis 1) was operationalized with four county-level variables: per capita income, unemployment rate, percentage of people who are 65 years old or older, and the number of active physicians per 1,000 persons in the county.

Environmental dynamism (hypothesis 2) was measured as the yearly change in the unemployment rate at the county level. The unemployment rate reflects the availability of resources and its fluctuation reflects the variation of resources in the environment.

Environmental complexity (hypothesis 3) was operationalized with four variables: market concentration, excess capacity, Medicare HMO penetration, and metropolitan versus nonmetropolitan area. The Herfindahl-Hirschman index (HHI) has been widely used to measure market concentration.⁵² It is defined as the sum of squared market shares (acute-care patient days for individual hospital/total acute-care patient days of all the hospitals in the county).⁵³ HHI represents

perfect competition when it scores 0 and the presence of a monopoly when it scores 1.

Excess capacity and Medicare HMO penetration have also been used to measure the degree of environmental complexity in terms of competition.⁵⁴ Competition is stronger when there is excess capacity. Hospitals compete for patients to fill the empty beds. In this study, excess capacity was measured in terms of the average number of unoccupied beds per hospital in the county. When there is a greater Medicare HMO penetration, Medicare HMOs have power over hospitals with respect to price negotiations. Medicare HMO penetration was measured as the number of Medicare HMO enrollees relative to the total number of Medicare eligibles in the county. Variable metropolitan versus non-metropolitan area was coded based on the Rural-Urban Continuum Codes of 2003. It was coded 1 if the hospital is located in a metropolitan county and coded 0 if the hospital is located in a nonmetropolitan county.

Hospital size (hypothesis 4) was measured as the total number of beds in the hospital. *Teaching status* (hypothesis 5) was coded "1" if the hospital did not have a teaching status and "0" if it had a teaching status. Hospitals can engage in medical education in three different, but not mutually exclusive, ways: (1) membership of the Council of Teaching Hospitals and Health Systems (COTH); (2) affiliation with a medical school; and (3) provision of residency programs. The hospital was defined as having a teaching status if it met one or more of the above criteria.⁵⁵

The following variables were used as control variables: outpatient mix, occupancy rate, payer mix, multihospital system membership, participation in a health network, and operating under contract management. To determine *outpatient mix*, it was nec-

essary to convert outpatient visits to their inpatient days equivalent. Research has suggested that outpatient services are less resource-intensive relative to inpatient services; resources consumed to provide one outpatient service are equivalent to one-third of the resources consumed to provide a service for one inpatient day.⁵⁶ Therefore, the inpatient days equivalent for outpatient visits was obtained by dividing total outpatient visits by three, and total equivalent inpatient days was obtained by summing inpatient days equivalent for outpatient visits and total inpatient days. Outpatient mix was defined as inpatient days equivalent for outpatient visits divided by total equivalent inpatient days.

Occupancy rate reflects the level of inpatient services utilization, and it was measured at the hospital level as the ratio of total inpatient days to the total number of beds times 365. Low occupancy rate has been consistently associated with higher risk of hospital financial distress.⁵⁷

Payer mix reflects the proportions of Medicare and Medicaid patients. Medicare and Medicaid are important sources of revenues for public hospitals, and can contribute to public hospital survival. Medicare mix was measured as total Medicare inpatient days divided by total inpatient days, and Medicaid mix as total Medicaid inpatient days divided by total inpatient days.

The American Hospital Association defines a multihospital system as "two or more hospitals owned, leased, sponsored, or contract managed by the central organization."⁵⁸ *Multihospital membership* is a dichotomous variable coded as "1" if the hospital was a member of a multihospital system and "0" if the hospital was not.

A network is defined as "a group of hospitals, physicians, other providers, insur-

ers and/or community agencies that work together to coordinate and deliver a broad spectrum of services to their community.”⁵⁹ *Participation in a health network* is a dichotomous variable coded as “1” if the hospital was engaged in such relationship and “0” if the hospital was not.

A hospital is under a contract management when an outside organization is fully responsible for its day-to-day operation.⁶⁰ *Contract management* is a dichotomous variable coded as “1” if the hospital was under contract management and “0” if the hospital was not.

Analysis

This study used random-effects logistic regression with year and state fixed-effects to control for time-invariant unobservable factors that are thought to be uncorrelated with each of the independent variables.⁶¹ Random-effects models are also appropriate for multilevel data structures such as public hospitals nested within the county. In addition, panel data have a multilevel structure because the repeated measurements over a certain period of time of each observation are clustered.⁶² The random-effects logistic regression model is described as:

$$\begin{aligned} \text{Log}(P_{it}/1-P_{it}) = & \beta_0 + \beta_1^* \text{Munificence}_{it} \\ & + \beta_2^* \text{Dynamism}_{it} \\ & + \beta_3^* \text{Complexity}_{it} \\ & + \beta_4^* \text{Size}_{it} + \beta_5^* \text{Teaching} \\ & \text{Status}_{it} + \beta_6^* \text{Control} \\ & \text{Variables}_{it} + a_i + u_{it} \end{aligned}$$

In which, P_{it} represents the probability that hospital “i” is in financial distress in year “t”. β_0 is the intercept for year “t”, a_i represents the time-invariant unobserved factors that are uncorrelated with each of the independent variables and u_{it} represents

the time varying errors.⁶³ The analysis was conducted using xtlogit function in STATA version 11.

Results

Figure 1 summarizes the descriptive statistics of the variables. There were a total of 7,257 hospital-years, of which 13 percent (N = 941 hospital-years) experienced financial distress. Twenty two percent of the public hospitals had teaching status, 32 percent were members of multihospital systems, 15 percent were under contract management, and 25 percent were involved in health networks. About half of the hospitals were located in metropolitan areas and the other half located in nonmetropolitan areas. We checked for potential multicollinearity by examining the correlations among independent variables, and none of the correlations was above 0.80.⁶⁴

Figure 2 summarizes the results of the random-effects logistic regression analysis. Hypothesis 1 was not supported; environmental munificence was not associated with the financial distress of public hospitals. Hypothesis 2 was not supported; greater environmental dynamism was not associated with higher odds of financial distress. Hypothesis 3 was partially supported; greater environmental complexity, in terms of higher Medicare HMO penetration, was associated with 5 percent greater odds of experiencing financial distress (OR = 1.05; $p \leq .000$).

Hypothesis 4 was supported. Larger hospitals had significantly lower odds of experiencing financial distress compared to smaller hospitals (OR = .997; $p \leq .05$); however, the effect of size was negligible as indicated by an odds ratio close to one. Hypothesis 5 was not supported; teaching status was not associated with a lower likelihood of financial distress.

Figure 1. Descriptive Statistics of All Variables^a

| | N | Mean (%) | Std. Dev. |
|--|-------|-----------|-----------|
| Dependent variable—financial distress | | | |
| Not in financial distress | 6,316 | (87.03) | |
| In financial distress | 941 | (12.97) | |
| Independent variables | | | |
| Per capita income | 7,225 | 26,633.04 | 8,760.17 |
| Unemployment rate | 7,238 | 5.74 | 2.64 |
| Proportion of population ≥ 65 | 7,239 | 0.14 | 0.04 |
| Physicians per 1,000 population | 7,239 | 1.86 | 1.98 |
| Medicare HMO penetration | 7,249 | 9.41 | 13.59 |
| Excess capacity | 7,239 | 55.87 | 36.70 |
| Herfindahl-Hirschman Index | 6,574 | 0.85 | 0.31 |
| Metropolitan vs. nonmetropolitan area | | | |
| Metropolitan area | 3,595 | (49.59) | |
| Nonmetropolitan area | 3,654 | (50.41) | |
| Change in unemployment rate | 7,232 | 0.06 | 0.24 |
| Hospital beds | 7,221 | 177.00 | 197.00 |
| Teaching status | | | |
| Teaching | 1,594 | (21.97) | |
| No teaching | 5,660 | (78.03) | |
| Control variables | | | |
| Occupancy rate | 7,155 | 0.56 | 0.19 |
| Medicare mix | 7,256 | 0.45 | 0.20 |
| Medicaid mix | 7,256 | 0.23 | 0.18 |
| Outpatient mix | 7,256 | 0.43 | 0.25 |
| System membership | | | |
| Nonmember | 4,953 | (68.25) | |
| Member | 2,304 | (31.75) | |
| Contract Management | | | |
| No contract | 6,138 | (84.58) | |
| Contract | 1,119 | (15.42) | |
| Health network | | | |
| No network | 5,465 | (75.31) | |
| Network | 1,792 | (24.69) | |

^a Hospital-year is the unit of analysis, N accounts for repeated observations

Figure 2. Results of Random-Effects Logistic Regression with Year and State Fixed-Effects^a

| Financial distress | | (N = 6446) ^b | | |
|--|------------------|-------------------------|---------------------|------|
| | Odds Ratio | Standard Error | 95% CI ^c | |
| Munificence | | | | |
| Per capita income | 1.01 | 0.2 | 0.97 | 1.06 |
| Unemployment rate | 1.07 | 0.06 | 0.98 | 1.16 |
| Proportion of population ≥ 65 | 1.04 | 0.04 | 0.97 | 1.13 |
| Physicians/1000pop | 0.99 | 0.11 | 0.80 | 1.24 |
| Complexity | | | | |
| Herfindahl-Hirschman Index | 0.66 | 0.16 | 0.34 | 1.31 |
| Excess capacity | 0.99 | 0.004 | 0.99 | 1.00 |
| Medicare HMO penetration | 1.05*** | 0.01 | 1.02 | 1.07 |
| Metropolitan vs. non-metropolitan area | 1.31 | 0.53 | 0.59 | 2.92 |
| Dynamism | | | | |
| Change in unemployment rate | 0.85 | 0.34 | 0.39 | 1.86 |
| Organizational factors | | | | |
| Hospital beds | 0.997** | 0.001 | 0.995 | 1.00 |
| Teaching status | 0.82 | 0.25 | 0.45 | 1.51 |
| Control variables | | | | |
| Occupancy rate | 0.23** | 0.12 | 0.08 | 0.67 |
| Outpatient mix | 0.34* | 0.19 | 0.12 | 1.01 |
| Medicare mix | 0.99 | 0.53 | 0.35 | 2.85 |
| Medicaid mix | 0.59 | 0.33 | 0.20 | 1.77 |
| System Membership | 3.49*** | 0.80 | 2.23 | 5.47 |
| Contract management | 1.14 | 0.24 | 0.75 | 1.73 |
| Health network | 0.71* | 0.12 | 0.49 | 1.04 |
| Overall Chi-square test | 199.89*** | | | |

* $p \leq 0.1$ ** $p \leq 0.05$ *** $p \leq 0.000$
^a Year and state dummy variables were included in analysis
^b N represents hospital-years
^c Confidence Interval

Our results also found that some of the control variables had statistically significant associations with financial distress. Compared to stand-alone hospitals, independent hospitals that became affiliated with multi-hospital systems had 3.49 greater odds of experiencing financial distress ($p \leq .000$) compared to stand-alone hospitals. Further, as occupancy rate increased, the odds of being in financial distress decreased ($OR = .22$; $p \leq .05$). Variables outpatient mix and health network were also negatively associated with financial distress but these associations were marginally significant ($OR = .34$ and $.71$ respectively; $p \leq .10$).

Discussion

The purpose of this study was to investigate the environmental and organizational factors associated with public hospitals' financial distress based on resource dependence theory. Our findings suggest that a more complex environment in terms of higher Medicare HMO penetration is the major environmental factor associated with public hospital financial distress. Our findings are consistent with Kim who reported a significant positive association between HMO penetration and financial distress among not-for-profit hospitals.⁶⁵ A greater market share of Medicare beneficiaries provides Medicare HMOs with stronger bargaining power that they can leverage to more aggressively negotiate prices. Therefore, hospitals may need to be highly efficient when they provide services for Medicare HMO enrollees.

Except for Medicare HMO penetration, we did not find any significant association between financial distress and the other environmental variables that measured munificence, dynamism, and complexity. One reason for this finding may be the fact

that different entities own public hospitals. Unlike private hospitals, public hospitals can be owned by a state, a city, or a county; however, the environmental variables are measured at the county level. Therefore, even if the county in which the hospital operates is less munificent, more dynamic, or more complex, these situations might not directly impact the financial situation of the public hospital if the state or the city that owns that hospital is still able to finance the hospital.

We also found that larger hospitals are less likely to experience financial distress, which corroborates the results from prior studies suggesting that organizational size has a positive impact on financial performance.⁶⁶ Several factors such as economies of scale,⁶⁷ accumulation of slack resources,⁶⁸ and bargaining power over suppliers⁶⁹ may be among the reasons for the positive association between organizational size and superior financial performance.

Our study also found that hospitals that are part of multihospital systems are more likely to be in financial distress compared to stand-alone hospitals. This finding is counterintuitive. From an RDT perspective, multihospital systems provide several resources to their members such as financial support, technology, and expertise, and they may benefit from economies of scale; however, it is possible that multihospital membership is endogenous to financial distress. Public hospitals in financial distress might seek affiliation with multihospital systems to solve their financial problems.⁷⁰ On the other hand, the acquisition of public hospitals in financial distress could be a strategy for multihospital systems to expand their market share and strengthen their competitive position.

Participation in health network is found to be negatively associated with financial distress. This finding is consistent with prior studies showing that network membership was positively associated with hospital financial performance.⁷¹ Network participation is an example of an interorganizational relationship that health care organizations initiate to have better access to resources.⁷² In health care, such resources include financial and human resources, legal support, knowledge, technologies, and the capability to deliver high quality care, among others.⁷³ Additionally, hospitals participating in networks may enhance their image and competitive positions that they can leverage in negotiating contracts with managed care organizations. Moreover, health care networks increase participants' bargaining power with suppliers and purchasers; and they enhance economies of scale and scope leading to cost savings and hospitals' efficiency and effectiveness.⁷⁴ Indeed, the strongest motive that leads health care organizations to participate in a network is the expectation of higher financial performance and enhanced efficiency.⁷⁵ Filling more hospital beds also decreases the odds of financial distress. It is important for public hospitals to attract more patients for increased patient revenue.

Managerial and Policy Implications

Hospitals play an important role in the health care delivery system yet they are highly resource intensive. Monitoring the financial situation of hospitals should be among the major responsibilities of a management team; however, the Altman Z-score has not been widely applied in health care management and health services research. The Altman Z-score can serve as a tool in

evaluating public hospitals' financial condition; the combination of the most important financial ratios into one discriminant function facilitates the evaluation of the organization's financial condition. Furthermore, the Altman Z-score could be used as a managerial tool for regularly scheduled "stress tests,"⁷⁶ and consequently intervene before it is too late.

In addition, our finding that participation in a health network is negatively associated with financial distress provides evidence that participation in a health network is a strategy to enhance public hospitals' financial situation. Health networks might provide additional resources that reduce public hospitals' operating costs and prevent financial distress. It also appears that higher Medicare HMO penetration is associated with a higher risk of financial distress. Public hospitals in such markets may need to focus on efficiency to ensure competitiveness or should actively seek other sources of revenues. It is clear that managed care imposes additional burdens on public hospitals and a proactive management style is necessary to avoid its negative effects.

Our finding that larger hospital size, higher occupancy rate, and greater outpatient mix are associated with lower odds of financial distress offers additional managerial insights. Managers may consider that in some markets mergers of public hospitals may be helpful in confronting financial troubles. In addition, public hospitals might consider stronger marketing strategies to attract more patients to fill empty beds. Furthermore, the finding that greater outpatient mix was negatively associated with financial distress makes the provision of outpatient services an attractive strategy to health care providers.⁷⁷

This study also has some policy implications. Since public hospitals serve a larger social purpose rather than pure profits, it may be important to increase financial support for public hospitals such as the disproportionate share hospital (DSH) program; however, PPACA plans to cut DSH payment by \$18 billion over a seven-year period from 2014.⁷⁸ This cut was decided under the argument that PPACA will reduce the number of uninsured to approximately 23 million by 2019 and consequently reduce the amount of uncompensated care.⁷⁹ Further research is needed to examine the consequences of reduction of DSH payments on public hospitals. An increase in the insured population may steer patients away from public hospitals resulting in further deterioration of their financial performance.

Limitations

Our study has some limitations. First, the unavailability of data with respect to the proportion of privately insured, underinsured, and uninsured patients was a study limitation. Because one of the most important roles of public hospitals is to provide care

to the indigent, including information on privately insured and the uninsured could have provided additional insights. Second, the operationalization of environmental dynamism presented another limitation to this study. Dynamism, which measures the fluctuation of the resources in the environment, is best measured as the yearly change in the measure of an environmental variable such as the yearly change in size of the county population, or the yearly change in the level of the county per capita income; however, the ARF variables do not contain complete data that cover all the years in this study. That is why dynamism was measured by the yearly change in county unemployment rate. Unemployment rate was the only environmental variable with complete data for all the years in this study. Finally, the study did not differentiate among public hospitals by state, county, and city ownership. This classification could be advantageous, given that the financing capabilities and policies of these states, counties, and cities are not the same. Future research should explore how the type of public hospital ownership may influence its risk for financial distress.

REFERENCES

1. Gabow, P, "Making a Public Hospital Work," *Health Affairs*, 20(4):182-187 (2001).
2. Frazee, T, Elixhauser, A, Holmquist, L, Johann, J, *Public Hospitals in the United States, 2008, Statistical Brief # 95*, accessed Oct. 30, 2011 at <http://www.hcupus.ahrq.gov/reports/stat-briefs/sb95.jsp>.
3. National Public Health and Hospital Institute, *America's Public Hospitals and Health Systems 2009: Results of the Annual NAPH Hospital Characteristics Survey*, accessed Nov. 4, 2011, at <http://www.naph.org/Main-Menu-Category/Our-Work/Safety-Net-Financing/Characteristics-Report/2009-Public-Hospital-Financial-Characteristics.aspx?FT=.pdf>.
4. Frazee, *supra*, n.2. California Association of Public Hospitals and Health Systems, "On the Brink: How the Crisis in California's Public Hospitals Threatens Access to Care for Millions", accessed Dec. 5, 2011 at <http://www.caph.org/content/upload/AssetMgmt/PDFs/Publications/WhitePaperFINAL.pdf>.
5. Bazzoli, JG, Cleverley, WO, "Hospital Bankruptcies: An Exploration of Potential Causes and Consequences," *Health Care Management Review*, 19(3):41-51 (1994); Weil, T,

- "Privatization of Hospitals: Meeting Divergent Interests," *Journal of Health Care Finance*, 38(2):1–11 (2011).
6. Department of Health and Human Services, "Health, United States, 2010: With Special Feature on Death and Dying," accessed Nov. 10, 2011 at <http://www.cdc.gov/nchs/data/hus/10.pdf>.
 7. John, K, "Managing Financial Distress and Valuing Distressed Securities: A Survey and a Research Agenda," *Financial Management*, 22(3):60–78 (1993).
 8. *Id.*
 9. McCue, MJ, "The Use of Cash Flow to Analyze Financial Distress in California Hospitals," *Hospital and Health Services Administration*, 21(2):223–241 (1991); Bazzoli, JG, Andes, S, "Consequences of Hospital Financial Distress," *Hospital and Health Services Administration*, 40(4):472–95 (1995); Langabeer, J, "Predicting Financial Distress in Teaching Hospitals," *Journal of Health Care Finance*, 33(2):84–92 (2006); Kim, TH, "Factors Associated with Financial Distress of Nonprofit Hospitals," *The Health Care Manager*, 29(1):52 (2010).
 10. McCue, *supra*, n.9.
 11. Kim, *supra*, n.9.
 12. Bazzoli and Andes, *supra*, n.9.
 13. Langabeer, *supra*, n.9.
 14. Altman, El, *Corporate Financial Distress and Bankruptcy*, New York, NY: John Wiley and Sons (1993).
 15. Pfeffer, J, "Developing Resource Dependence Theory: How Theory Is Affected by its Environment. In Smith, K, Hitt, M, (Eds.), *Great Minds in Management: The Process of Theory Development*, New York, NY: Oxford Press University (2005).
 16. Langabeer, *supra*, n.9.
 17. Pfeffer, J, Salancik, G, *The External Control of Organizations: A Resource Dependence Perspective*, New York, NY: Harper and Row (1978).
 18. Pennings, J, "The Relevance of Structural Contingency Model for Organizational Effectiveness," *Administrative Science Quarterly*, 20(3):393–410 (1975).
 19. Stearns, TM, Hoffman, AN, Heide, JB, "Performance of Commercial Television Stations as an Outcome of Interorganizational Linkages and Environmental Conditions," *The Academy of Management Journal*, 30(1):71–90 (1987).
 20. Ulrich, D, Barney, JB, "Perspectives in Organizations: Resource Dependence, Efficiency and Population," *The Academy of Management Review*, 9(3):(1984).
 21. Pfeffer, J, *supra*, n.15; Ulrich and Barney, *supra*, n.20; Aldrich, HE, Pfeffer J, "Environments of Organizations," In Inkeles, A. (Ed.) *Annual Review of Sociology*, Palo Alto, CA: Annual Reviews (1976).
 22. Dess, GG, Beard, DW, "Dimensions of Organizational Task Environments," *Administrative Science Quarterly*, 29(1): 52–73 (1984); Boyd, B, "Corporate Linkages and Organizational Environment: A Test of the Resource Dependence Model," *Strategic Management Journal*, 11(6):419–430 (1990).
 23. Dess and Beard, *supra*, n.22; Alexander, J, D'Aunno, T, Succi, MJ, "Determinants of Profound Organizational Change: Choice of Conversion or Closure among Rural Hospitals," *Journal of Health and Social Behavior*, 37(3):238–251 (1996); Margarethe, FW, Bantel, KA, "Top Management Team Turnover as an Adaptation Mechanism: The Role of the Environment," *Strategic Management Journal*, 14(7):485–504 (1993); Trinh, HQ, Begun JW, "Strategic Adaptation of US Rural Hospitals During an Era of Limited Financial Resources: A Longitudinal Study, 1983 to 1993," *Health Care Management Science*, 2(1):43–52 (1999).
 24. Brecher, C, Nesbitt, S, "Factors Associated with Variation in Financial Condition among Voluntary Hospitals," *Health Services Research*, 20(3):267–300 (1985); Friedman, B, Shortell, S, "The Financial Performance of Selected Investor-owned and Not-for-profit System Hospitals Before and After Medicare Prospective Payment," *Health Services Research*, 23(2):237–267 (1988).
 25. Kim, *supra*, n.9.
 26. Begun, JW, Kaissi, A, "Uncertainty in Health Care Environments: Myth or Reality?," *Health Care Management Review*, 29(1):31–19 (2004).
 27. Kotha, S, Nair, A, "Strategy and Environment as Determinants of Performance: Evidence

- from the Japanese Machine Tool Industry," *Strategic Management Journal*, 16(7):497–518 (1995); Simerly, RL, Li, M, "Environmental Dynamism, Capital Structure and Performance: A Theoretical Integration and an Empirical Test," *Strategic Management Journal*, 21(1):31–49 (2000).
28. Doherty, RB, "The Certitudes and Uncertainties of Health Care Reform," *Annals of Internal Medicine*, 152(10):679–682 (2010).
 29. Baum, RJ, Wally, S, "Strategic Decision Speed and Firm Performance," *Strategic Management Journal*, 24(11):1107–1129 (2003); Goll, I, Rasheed, A, "The Moderating Effect of Environmental Munificence and Dynamism on the Relationship Between Discretionary Social Responsibility and Firm Performance," *Journal of Business Ethics*, 49(1):41–54 (2004).
 30. Dess and Beard, *supra*, n.22; Begun and Kaisi, *supra*, n.26.
 31. Duncan, RB, "Characteristics of Organizational Environments and Perceived Environmental Uncertainty," *Administrative Science Quarterly*, 17(3):313–327 (1972).
 32. Kim, *supra*, n.9; Brecher and Nesbitt, *supra*, n.24; Friedman and Shortell, *supra*, n.24.
 33. Brecher and Nesbitt, *supra*, n.24.
 34. Kim, *supra*, n.9.
 35. *Id.*; Simerly and Li, *supra*, n.27; Goll and Rasheed, *supra*, n.29.
 36. Kim, *supra*, n.9; NORC Walsh Center for Rural Health Analysis, Financially Distressed Rural Hospitals in Four States, accessed Jan. 13, 2012 at http://www3.norc.org/NR/rdonlyres/99DA930E-4C63-4EBC-B9A7-E07148BF4A46/0/WalshCtr2004_Nseries-Jan04v2.pdf.
 37. Hall, M, & Weiss, L, "Firm Size and Profitability," *The Review of Economics and Statistics*, 49(3):319–331 (1967).
 38. Porter, M, *Competitive Advantage*, NY: Free Press (1985).
 39. Sharfman, M, Wolf, G, Chase, R, Tansik, D, "Antecedents of Organizational Slack," *Academy of Management Review*, 13(4):601–614 (1988).
 40. Ayanian, J, Weissman J, "Teaching Hospitals and Quality of Care: A review of the Literature," *Milbank Quarterly*, 80(3):569–593 (2002); Reuter, J, Gaskin, D, "Academic Health Centers in Competitive Markets," *Health Affairs*, 16(4):242–252 (1997).
 41. Ayanian and Weissman, *supra*, n.40; Moses III, H, Their, S, Matheson, D, "Why Academic Health Centers Survived?," *Journal of the American Medical Association*, 293(12):1495–1500 (2005).
 42. Ayanian and Weissman, *supra*, n.40.
 43. Rosko, MD, "Performance of US Teaching Hospitals: A Panel Analysis of Cost Inefficiency," *Health Care Management Science*, 7(1):7–16 (2004).
 44. Tennyson, DH, Fottler, MD, "Does System Membership Enhance Financial Performance in Hospitals?," *Medical Care Research and Review*, 57(1):29–50 (2000).
 45. Younis, MZ, Forgione, DA, "Using Return on Equity and Total Profit Margin to Evaluate Hospital Performance in the U.S.: A Piecewise Regression Analysis," *Journal of Health Care Finance*, 31(3):82–88 (2005).
 46. Pink, GH, Holmes, M, D'Alpe, C, Strunk, L, McGee, P, Slifkin, R, "Financial Indicators for Critical Access Hospitals," accessed Nov. 10, 2011 at http://www.flexmonitoring.org/documents/BriefingPaper7_FinancialIndicators.pdf.
 47. Langabeer, *supra*, n.9; Altman, EI, "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy," *The Journal of Finance*, 23(4):589–609 (1968); Altman, EI, "Predicting Financial Distress of Companies: Revisiting the Z-score and Zeta Models," accessed Nov. 10, 2011 at <http://www.iiiglobal.org/component/jdownloads/finish/648/5645.html>; Almwajeh, O, "Applying Altman's Z-score Model of Bankruptcy for the Prediction of Financial Distress of Rural Hospitals in Western Pennsylvania", accessed Jan. 13, 2011 at sunzi.lib.hku.hk/ER/detail/hkul/3517030.
 48. Langabeer, *supra*, n.9.
 49. Altman, EI, "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy," *The Journal of Finance*, 23(4):589–609 (1968); Altman, EI, "Predicting Financial Distress of Companies: Revisiting the Z-score and Zeta Models," accessed Nov. 10, 2011 at <http://www.iiiglobal.org/>

- component/jdownloads/finish/648/5645.html.*
50. Altman, EI, "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy," *The Journal of Finance*, 23(4):589–609 (1968).
 51. Langabeer, *supra*, n.9.
 52. Lee, S, Alexander, JA, "Managing Hospitals in Turbulent Times: Do Organizational Changes Improve Hospital Survival?," *Health Services Research*, 34 (4):923 (1999); Sloan, FA, Ostermann, J, Conover, CJ, "Antecedents of Hospital Ownership Conversions, Mergers, and Closures," *Inquiry-the Journal of Health Care Organization Provision and Financing*, 40 (1):39–56 (2003); Weech-Maldonado, R, Qaseem, A, Mkanta, W, "Operating Environment and USA Nursing Homes' Participation in the Subacute Care Market: A Longitudinal Analysis," *Health Services Management Research*, 22(1):1–7 (2009); Kim, *supra*, n.9.
 53. Kim, *supra*, n.9.
 54. Weech-Maldonado, Qaseem, and Mkanta, *supra*, n.52.
 55. Bazzoli, JG, Chan, B, Shortell, S, D'Aunno, T, "The Financial Performance of Hospitals Belonging to Health Networks and Systems," *Inquiry: A Journal of Medical Care Organization, Provision and Financing*, 37(3):234–252 (2000).
 56. Detsky, A, O'Rourke, K, Naylor, D, Stacey, S, Kitchens, J, "Containing Ontario's hospital costs under universal insurance in the 1980s: What was the record?," *Canadian Medical Association Journal*, 142(6):565–572 (1990); Vujicic, M, Addai, E, Bosomprah, S, "Measuring Health Workforce Productivity: Application of a Simple Methodology in Ghana. Health Nutrition and Population Discussion Paper" accessed Jan. 24, 2012, at <http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATION/Resources/281627-1095698140167/MeasuringHlthWorkforce.pdf>.
 57. McCue, *supra*, n.9; Kim, *supra*, n.9; Trussel, J, Patrick, P, "An Empirical Analysis of Financial Distress in Pennsylvania Hospitals," *Journal of Health Care Finance*, 36(1):31–60 (2009); Liu, L, Jervis, K, Younis, Mz, Fiorgione, DA, "Hospital Financial Distress, Recovery and Closure: Managerial Incentives and Political Costs," *Journal of Public Budgeting, Accounting and Financial Management*, 25(1):31–68 (2011).
 58. American Hospital Association, "Facts on US Hospitals," accessed Jul. 27, 2013 at <http://www.aha.org/research/rc/stat-studies/fast-facts.shtml>.
 59. *Id.*
 60. Alexander, JA, Morrissey, MA, "A Resource-dependence Model of Hospital Contract Management," *Health Services Research*, 24(2):259–284 (1989).
 61. Wooldridge, JM, *Introductory Econometrics: A Modern Approach*, New Delhi: Akash Press (2006).
 62. Li, B, Lingsma, H, Steyerberg, E, Lesaffre, E, "Logistic Random Effects Regression Models: A Comparison of Statistical Packages for Binary and Ordinal Outcomes," *BMC Medical Research Methodology*, 11: 1–11 (2011), accessed Jul. 25, 2013 at <http://www.biomedcentral.com/content/pdf/1471-2288-11-77.pdf>.
 63. Woolridge, *supra*, n.61.
 64. Field, A, *Discovering Statistics Using SPSS*, Thousand Oaks, CA: SAGE Publication, Inc. (2009).
 65. Kim, *supra*, n.9.
 66. Kim, *supra*, n.9; Kotha and Nair, *supra*, n.27; Goll and Rasheed, *supra*, n.29; NORC, *supra*, n.36.
 67. Hall and Weiss, *supra*, n.37.
 68. Sharfman, *et al.*, *supra*, n.39; Wan, WP, Yiu, DW, "From Crisis to Opportunity: Environmental Jolt, Corporate Acquisitions, and Firm Performance," *Strategic Management Journal*, 30(7):791–801 (2009).
 69. Porter, *supra*, n.38.
 70. McCue, MJ, Furst, R, "Financial Characteristics of Hospitals Purchased by Investor-owned Chains," *Health Services Research*, 21(4):515–527 (1986).
 71. Bazzoli, *et al.*, *supra*, n.55; Broyles, RW, Brandt Jr., EN, Biard-Holmes, D, "Networks and the Fiscal Performance of Rural Hospitals in Oklahoma: Are they Associated?," *The Journal of Rural Health*, 14(4):327–337 (1998); Nauenberg, E, Brewer, CS, Basu, K, Bliss, MK, Osborne, JW, "Network Structure

- and Hospital Financial Performance in New York State: 1991–1995,” *Medical Care Research and Review*, 56(4):415–439 (1999).
72. Pfeffer, *supra*, n.15.
73. Bazzoli, *et al.*, *supra*, n.55; Nauenberg, *et al.*, *supra*, n.71; Bazzoli, JG, Shortell, S, Ciliberto, F, Kralovec, P, Dubbs, N, “Tracking the Changing Provider Landscape: Implications for Health Policy and Practice,” *Health Affairs*, 20(6): 188–196 (2001); Federico, L, “Strategies for Multihospital Networks: A Framework,” *Health Services Management Research*, 18(2):86–99 (2005).
74. Bazzoli, *et al.*, *supra*, n.55; Broyles, *et al.*, *supra*, n.71; Federico, *supra*, n.73.
75. Nauenberg, *et al.*, *supra*, n.71.
76. Calandro, JJ, “Considering the Utility of Altman’s Z-score as a Strategic Assessment and Performance Management Tool,” *Strategy & Leadership*, 35(5):37–43 (2007).
77. Donnelly, JM, “Hospitals Turn to Outpatient Services to Offset Inpatient Care Cuts”. *Boston Business Journal*, accessed Feb. 25, 2012 at <http://www.bizjournals.com/boston/print-edition/2011/08/26/hospitals-turn-to-out-patient-services.html>.
78. Andrulis, D, Siddiqui, N, “Health Reform Holds Both Risks and Rewards For Safety-Net Providers and Racially and Ethnically Diverse Patients,” *Health Affairs*, 30(10):1830–1836 (2011).
79. *Id.*

Using a Social Entrepreneurial Approach to Enhance the Financial and Social Value of Health Care Organizations

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In this study, a conceptual framework was developed to show that social entrepreneurial practices can be effectively translated to meet the social needs in health care. We used a theory-in-use case study approach that encompasses postulation of a working taxonomy from literature scanning and a deliberation of the taxonomy through triangulation of multilevel data of a case study conducted in a Taiwan-based hospital system. Specifically, we demonstrated that a nonprofit organization can adopt business principles that emphasize both financial and social value. We tested our model and found comprehensive accountability across departments throughout the case hospital system, and this led to sustainable and continual growth of the organization. Through social entrepreneurial practices, we established that both financial value creation and fulfilling the social mission for the case hospital system can be achieved.

Key words: *social entrepreneurship; financial value; financial sustainability; social capital; enterprise value; social value*

Introduction

The health care sector is in transition globally. Reforms in the United States and emerging economies in Asia and other nations around the world are calling for viable models to provide financially sustainable health services in the current turbulent and uncertain environment. There is growing awareness and concern regarding social demands and health care costs. For instance,¹ there are ongoing discussions about hospitals' attempts to fulfill their social mission while maintaining financial and operational sustainability. Many hospitals (mostly nonprofit) receive credit for services funded by the government. This political factor makes public subsidies sensitive to changes in federal revenues,¹ and hence these nonprofit hospitals are challenged to find alternative revenue sources to avoid welfare dependency.² Many hospital administrators have advocated the adoption of entrepreneurship in terms of patient-centered care, market responsiveness, and sustainability in the health sector,³ but barriers remain due to

the health care structure, cultural influences, financing, and delivery of services.⁴ Social entrepreneurship, which is part of a broader

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family of entrepreneurship, permits us to conceptualize systems and processes that are designed to achieve social change⁵ and to generate surplus to support activities that cannot generate revenue.⁶ That is, social entrepreneurship is critical for generating social impact and assuring financial sustainability. Entrepreneurial orientation with a social focus is a tool that allows the leadership team to proactively strategize to anticipate environmental changes and to lead the social movements that have policy implications.

In this research, the authors aim to develop a model by which the social entrepreneurial approach can be effectively translated to meet the social needs in health care. We use a theory-in-use case study approach that encompasses postulation of a working taxonomy from literature scanning and a deliberation of the taxonomy through triangulation of multilevel data of a case study conducted in a Taiwan-based hospital system that has an established reputation for effectively using business operating principles in managing hospitals.⁷ In this article, we first develop the conceptual taxonomy that is theoretically underpinned, with the plan that it will serve as a framework for case delineation and construct building for future research in health care.

Conceptual Framework Development

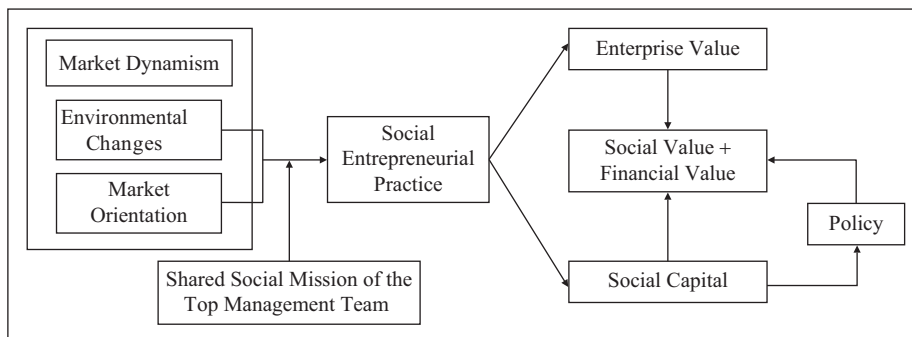
Entrepreneurial Process with a Social Focus

Entrepreneurship involves a process that proactively recognizes opportunities, takes risks, and provides for innovative new approaches for providing customer-centric solutions.⁸ “Social entrepreneurship” was a term used to refer more narrowly to an enterprise’s application of market-oriented principles in the nonprofit or public sector,⁹ but this definition has gradually been broad-

ened to include all business practices of an enterprise that assumes financial, personal, and organizational reputation risks when stimulating social changes and progress.¹⁰ Even though businesses focus on economic returns, social enterprises emphasize the organization’s mission for generating social value and advancing social change¹¹ so as to obtain their legitimacy and needed resources.¹² As such, a conventional entrepreneurial orientation that encompasses only the entrepreneurial attributes of risk-taking, opportunity-recognition, and innovativeness falls short of addressing issues that contribute to sustaining socially relevant initiatives.

Market Dynamism

As shown in our conceptual model (Figure 1), a taxonomy for building social value is developed illustrating the process of social entrepreneurial practice. Specifically, market dynamism is the driving force of the environment coupled with the organization’s market orientation. Together, these can effectively impact entrepreneurship. For instance, when businesses compete in an especially volatile market, market intelligence is critical for those organizations to retain their financial stability and sustainability. Kohli and Jaworski (1990)¹³ identified market orientation as an on-going process of market information generation and dissemination. Market-oriented organizations tend to excel in their capabilities for seeking and using market information to best generate and deliver a superior customer value,¹⁴ and their market orientation has been found to drive entrepreneurship.¹⁵ In addition, environment changes also impact market dynamism. For example, global concerns of health disparity, social justice, economic

Figure 1. A Taxonomy for Building Social Value through Social Entrepreneurial Practice

recession, and other social-economic environment changes have led to an increased awareness of the sustainable utilization of global resources. More government agencies are using contracts and vouchers to ensure measurable performance in the delivery of social services by both nonprofit and for-profit organizations. Because these organizations are competing in the same market segment,¹⁶ their fierce competition has compelled them to become more innovative and outcome-driven.¹⁷ Furthermore, environmental changes such as recent debates on health care reform in the United States and other emerging economies have created a stronger sense of uncertainty regarding the future of health care payer models and health care delivery systems that address the determinants of health.¹⁸ As a result, market dynamism is the first element affecting social entrepreneurship.

Shared Social Visions of Top Management Teams

In addition to market dynamism, the shared social vision of top management teams determines the organization's entrepreneurial practice. In particular, the shared vision is socially driven. Moreover, social

entrepreneurs are motivated by recognized market failures,¹⁹ but they view social value creation as an organization's explicit and central mission.²⁰ Hence, this determination influences their specific marketing strategies, actions that place a relatively higher priority on social value creation while, in the meantime, borrowing business principles from their commercial counterparts.²¹ During the social value creation process, risks are inevitable because any failure of the mission may impair the reputation and sustainability of the social enterprise or even the entrepreneur's personal reputation.²² The buy-in from the top management team (TMT)²³ and the operation team are pivotal, yet challenging for the organization to evolve into a social-entrepreneurial culture. Organizations without the shared social vision tend to have multiple and possibly divergent directions or views;²⁴ thus, the shared social vision from top management teams is essential to successful entrepreneurial practice.

Social and Financial Value Creation

For-profit organizations measure their performance more obviously by means of their profit generation. For social entrepreneurs,

understanding and maximizing social value creation is the primary performance focus and is based on the organization's social mission. Enterprise value is an important part of the model because social enterprises are considered change agents in society. They are able to create a sustainable social movement. Social enterprises can adopt an "earned income" strategy during the social value creating process²⁵ to ensure their financial sustainability and self-sufficiency.²⁶ Social value and economic value creation should not be dichotomous. As shown in Figure 1, social and economic (or financial) values are connected. For example, the Roberts Enterprise Development Fund (REDF) coined the term "social return on investment" (SROI) as an outcome of the entrepreneurial process.²⁷ SROI quantifies the financial outcome and the social value that is generated, and it measures the sustainability of the enterprise. Kent and Anderson (2002)²⁸ advocated that social entrepreneurs should be the "bridge builder(s)" working to create communities through which social value is to be generated. Social capital, which is broadly defined as an intangible asset embedded in relationships,²⁹ can be leveraged to facilitate action and contribute to the organizations' levels of performance by increasing communication efficiency,³⁰ decreasing the cost of transactions,³¹ and leading to a synergistic enhancement of performance.³² Social capital should therefore enhance social and economic/financial value creation and result in policy change. As described above, Figure 1 depicts the proposed drivers for an organization's social entrepreneurial practices and the resulting outputs. The case study systematically delineates individual constructs and discerns their relations using our conceptual framework.

Methods

The global health care industry is becoming increasingly more complex and challenging as world nations and economies grow ever more closely entangled. The task at hand is more than merely leadership development, cost containment, or technology adoption; rather, it demands a fundamental development of a viable business model that will allow hospitals to serve their target segments sustainably. We adopted a theory-in-use case study methodology that entails deducing a working taxonomy from literature based on scanning and using the taxonomy of an instrumental case study.³³ In this epistemological process, the case plays a supportive role in facilitating the understanding of the concepts within the health care context. The transcripts of the interviews and the content of the publications and documents related to strategies, operation plan, and meeting minutes are reviewed, organized, and analyzed to determine core constructs, the contexts in which these constructs are translated into activities and actions, and the resulting consequences. Based on data analyses, core outcomes are measured in terms of the value generated in financial and social dimensions.

Both forms of well-defined knowledge, namely constructivism and pragmatism, direct the strategies of inquiry and methods of data collection and analysis in this process. Patton (2002)³⁴ stressed the importance of the study purpose in designing qualitative studies along the theory-action continuum. During the preliminary stage of developing a theoretical taxonomy for adopting a social entrepreneurial approach for sustainable social value creation, the theory-in-use case study methodology is both meaningful and appropriate for attaining insights and ideas that aim to increase familiarity with the

context and issues and to help generate testable hypotheses.³⁵ The case hospital system in Taiwan is a private health care system that is renowned for its service innovation and efficiency.³⁶ With the proposed taxonomy, we examined in-depth the relationships between the changes in the external environment, the entrepreneur's market orientation, and the organizational development and outputs. Taiwan has modeled its health care practices on those of the United States after World War II. The majority of the key players in its health care sector were US trained. Due to its single-payer National Health Insurance system, which provides universal health coverage to its 23 million people, Taiwan has served as a pilot testing laboratory for a number of care models over the years. Hence, the lessons learned from Taiwan's health care system have been widely discussed in various forums in the United States and the Asia-Pacific region, in particular, within China.³⁷

We collected data from focus group studies and one-on-one interviews with the instrument encompassing the following items:

- (1) Please elaborate on the environment and the impetus for the initial establishment of the case hospital system. What are the founder's vision, expectation, strategic orientation, and his perspectives regarding social mission/responsibilities? What are the strategic directions/planning that you are aware of? How much has been accomplished so far, from your perspective?
- (2) What are the unique attributes of the case organization and its culture? What is the evolution of the case hospital system's social mission, its organizational culture, and the services to the community?
- (3) Around the time of the promulgation of National Health Insurance, how was the case system in serving the target populations?
- (4) Based on the informant's experience and understanding, what are the system's contributions to and/or influences on the society and the health care sector?
- (5) How has the case hospital system been adapting to the societal and/or environmental changes?
- (6) What are the performance outcomes of the case hospital system?

A total of 13 informants were interviewed, including the former superintendent (equivalent to the position of hospital director in the US), chair of the steering committee, the current director of the administrative office, senior managers/administrators from administration, clinical departments, the emergency department, laboratory, and pharmacy, and frontline leaders from clinical departments. A particularly close scrutiny of personal writings from the founder and former director of the case hospital system's Office of Administration provided for a critical understanding of the founding mission, vision, and operating principles. The informants' experiences with the hospital ranged from 5 to 32 years. They personally witnessed the hospital's establishment and evolution through their participation in the strategic development and implementation process. All interviews were audio-taped and transcribed to provide accurate data analyses.

The data analysis process was dynamically intertwined with theory and data, and this process involved (1) discerning recurring categories and emerging themes; and (2) employing the constant comparative method to ensure

the internal and external significance of each theme. The context for data analysis was defined within the historical context of the case hospital system and the evolution of its operations. The corresponding author has maintained close collaborations with the case hospital system, through which she has been able to continually update the required findings and correspond with informants with the purpose to best address any ongoing issues discovered in the process.

Findings

During the 1970s, the health care system in Taiwan was composed of small private clinics and large, primarily public general hospitals. The capacity of these large hospitals in terms of their medical service abilities and quality was determined to be insufficient for meeting the market demand. The ratio of the number of physicians per 1,000 people was merely 0.4, compared to 1.6 doctors per 1,000 people in 2010,³⁸ and the emergency departments (ED) were primarily staffed with resident physicians. This insufficient and inappropriate provision of care at the ED victimized the father of a successful entrepreneur. In memory of his father, the entrepreneur founded the first privately owned general hospital on the island in 1976 with the clearly articulated mission of “promoting social welfare.” The founder managed to maintain that aspiration for the following three decades when serving as chair of the board of directors for the case hospital system.

Entrepreneur’s Market-Orientation

In response to the keen competition from its public hospital counterparts and the lack of support from government, the founder adopted the operating principles of his US\$69 billion conglomerate, with an annual revenue

that accounted for 17 percent of Taiwan’s GDP by 2008. During the formative phase of the case hospital, it specifically targeted blue-collar workers, operated with a lean process, and collected timely customer feedback. The founder also invested heavily in recruiting the best talents globally for the leadership team of the case hospital.³⁹ Furthermore, he personally devoted his time and effort into learning the business from these experts and directly from patients and their families through the “Superintendent’s mailbox.” At the management level, a series of weekly meetings provided a platform for the departments’ business managers to disseminate information and to engage in formulating institutional responses to the information gathered. The case hospital system has prided itself on its research, continuing education and training of its medical staff, and ownership of the state-of-the-art technology, facility, and equipment.

Being the first privately owned large-scale general hospital with a broadened access to health care for all, the case hospital system grew rapidly and, as a result, invited more competition into the market place. According to an interviewee,

The government saw us as a strong rival and, to stay competitive, they were willing to approve the budget request(s) from other public hospitals for their upgrades and expansion in technology and infrastructure.

In addition, its growing economic value enticed other business conglomerates to enter into Taiwan’s health care sector to the extent that the government had to establish legislation to better monitor the financial performance of these foundation-owned private hospitals.

Shared Mission of the Top Management Team

The founder formed a leadership team that was composed of the superintendent, the vice superintendent, the chairman of the Medical Executive Committee, and directors of the Administrative Offices from both the case hospital system and his business enterprise. They conducted weekly dinner meetings on Friday nights to discuss and examine extensively the operational plans and the execution of such plans. These frequent face-to-face meetings of the management team were instrumental in both cultivating the organizational core value of “treating patients as our own family” and establishing a lean and tightly controlled operational infrastructure at the formative phase of the case hospital system.

The director from the business enterprise played a crucial role in building the systems and processes by translating business principles into the health care context. The “cost-down” concept became a major concern across the board from areas as divergent as cafeteria logistics to renal dialysis.⁴⁰ The Friday night dinner meetings later evolved into a series of regular daily luncheons, and weekly, biweekly, or monthly meetings attended by various levels of the management teams. In 1985, a formal Medical Steering Committee was established to govern clinical care, teaching, and research programs.⁴¹ The vision of the TMT was clearly articulated, according to the informant, as one in which:

- (1) The case hospital system should provide quality care at an affordable price to the public;
- (2) All leaders should own the not-for-profit mindset and aim to generate social benefits instead of personal economic gains; and
- (3) the case hospital system should be devoted to advanced medical service and science through research and education.

Following the formative stage of the case hospital system, the founder had dedicated an ongoing 1 percent of the revenue from the daily operations to the system’s charity fund until he passed away in 2010. This fund was found to be particularly useful during the pre-National Health Insurance (NHI) era because the government had imposed stringent criteria for qualifying low-income families for public medical assistance. Some informants believed that this practice later instigated the government’s policy of requiring all the foundation-owned hospitals to allocate 10 percent of their surplus to a social service fund.

Entrepreneurial Practices Focusing on Financial and Social Values

During its formative phase, the case hospital system provided transportation to patients in rural areas to provide these individuals with access to proper health care. This system also was the first in Taiwan to deploy only attending physicians instead of residents or interns to the emergency department (ED) to ensure the proper treatment of patients in the ED where the founder’s father had lost his life as a result of delayed treatment. Moreover, the case hospital system developed a streamlined one-stop payment system to allow for outpatient and deposit-free inpatient registration processes.

Guided by their shared social mission, the case hospital system’s top management team strictly prohibited their physicians from “moon-lighting” or accepting “gift-money.” The gift-money (more com-

monly referred to as the “red envelope”) was and is still a prevalent practice in some hospitals in Taiwan whereby doctors are incentivized to expedite the scheduling or preferentially treat the patients. Often times, it is given to surgeons before the operation in accordance with a “market price.” Sometimes such red-envelope fees can be correlated with a significant source of income for more well-known doctors within the nation. Therefore, to ensure effective implementation of these policies with doctor/patient satisfaction, the case hospital system initiated a performance-based physician fee (PF) payment system. The administration determined the PF rate based on the physician’s: (1) service volume, (2) seniority, and (3) overall contributions to the department in administration, clinical teaching, and profession. A ceiling was imposed, and surplus was pooled into a hospital fund for sponsoring activities such as travel expenses for attending work-related conferences under the auspices of the department of medical affairs.⁴²

The case hospital system emphasized cost-containment strategies to ensure its healthy financial outlook, and the system established a knowledge management infrastructure to better standardize its internal operations. The infrastructure integrated the hospital system’s centralized procurement and inventory control system with that of the founder’s conglomerate for procuring hospital supplies directly from the company. To manage these complex business systems and processes, the case hospital system staffed its Administration Center at the senior management level with “professional executives” who are responsible for formulating strategies, supervising hospital operations, and developing departmental

leaders. These executives, functioning like the think tank of the hospital superintendent, routinely rotated across all departments in order to acquire a first-hand understanding of the frontline operation. At the operational front, “accountability managers” in turn led and managed a total of 3,783 (as of the Year 2011) “accountability centers” across all clinical departments and business offices, and monitored and audited their respective services against 140 existing service and quality indices, for example, wait time and number of visits.⁴³ These key performance indices were determined by the Administration Center based on the management-by-objectives (MBO) process. During the monthly operation management meetings, individual clinical specialties were reviewed on a periodic basis. Any budgetary gap called for a closer scrutiny by the responsible accountability manager to determine a timely and appropriate course of action.

This unified information system has been instrumental in the case hospital system’s efforts in bundling patient care for those with chronic conditions. First, the hospital pharmacy launched an expedited dispensing service both to automatically package together the routine prescription refills for frequent users and to manually dispense new prescriptions. The case managers then coordinated the inter-specialty patient care, which engaged physicians across departments to share and evaluate patient information and treatment regimens and also had a greater focus on assisting in the development and monitoring of a comprehensive treatment plan for individual patients. When Taiwan’s NHI launched the integrated-care initiative for patients with multiple chronic conditions in December 2010 by offering a NT\$1,000 (US\$34) per case incentive to the participating hospitals,

the case hospital system was already prepared and readily joined the national initiative, which resulted in an additional revenue source for the organization.

Multiple Dimensions of Outputs

Enterprise value. The case hospital system's entrepreneurial practice has resulted in the building of a significant enterprise value (Tables 1 and 2), which led to its sizable social and financial values (Table 2), thus becoming the largest health care system in Taiwan. The hospital system has expanded to maintain more than 10,000 beds in eight hospital complexes spreading across six different geographical regions; by 2010, it had a total of 342,336 admissions and 7,210,016 outpatient visits, which amounted to a total of 8 percent of the annual outpatient visits in Taiwan. Its annual revenue of US\$1.561 billion in 2010 amounted to approximately 10 percent of the NHI total expenditures rendered to serving its insured. The business model borrowed from the founder's conglomerate has allowed the case hospital system to provide patient-centered care with a healthy surplus margin even with the NHI's stringent and tightly controlled global budget system since 2002.⁴⁴

Social capital. During the 1970s and 1980s, when there were just a few teaching hospitals, the case hospital system opened its door and offered internships to medical students from other medical schools.⁴⁵ Today, approximately one-fourth to one-third of all of the practicing physicians in Taiwan are derived from these programs. Many of the hospitals that were managed or led by these alumni have adopted a similar management system and the business philosophy. The established strategic alliances and the accumulated social capital evolved into a social force that has continually driven the transformation of Taiwan's health care policies and systems. As one informant commented:

The health care sector in Taiwan went from 30 percent privately owned hospitals to 70 percent from the 80s. The keener competition continued to drive the advancement in hardware (such as facilities and medical equipment) and software (the managerial and clinical skills training of the medical professionals), which allowed an earlier institution of National Health Insurance from 2000 to 1995. The availability of insurance helped particularly those who are under the poverty line and those who contract catastrophic ailments.

Table 1. Annual Service Volume and Number of Staff in Case Hospital System, 2008–2010

| Year | Annual Service Volume | | | Number of Staff | | |
|------|-----------------------|-----------|-----------|---|------------|--------|
| | Outpatient | Inpatient | Emergency | Staff (excluding physicians and nurses) | Physicians | Nurses |
| 2008 | 7,238,168 | 327,612 | 493,226 | 7,908 | 2,806 | 7,185 |
| 2009 | 7,332,406 | 326,342 | 513,723 | 8,438 | 2,906 | 7,408 |
| 2010 | 7,210,016 | 342,336 | 507,962 | 8,715 | 2,944 | 7,579 |

Table 2. Financial Performance of the Case Hospital System, 2008–2010

| Year | Total revenue in US\$ ^a | Total revenue/Staff in US\$ (including Medical staff) | Debt/assets |
|------|------------------------------------|--|-------------|
| 2008 | 1.486 billions | 438,000 | 3.86% |
| 2009 | 1.523 billions | 423,000 | 2.77% |
| 2010 | 1.561 billions | 450,000 | 2.13% |

^aUS\$1 is roughly equivalent to NT\$30 from 2008–2010.

The case hospital system has been recognized as an important agent of change for the health care industry in Taiwan; many of those changes have essentially resulted in creating social value for patients at the national level and led to financial success for the organization. Recognizing the growing global economy, the case hospital system has begun to build its social capital by training about 160 to 190 interns from medical schools in the emerging economies during the years 2008 to 2010.

Social and economic/financial value with policy implications. With its founding principle of “serving the interests of patients first,” all caregivers were required to provide patient-centered services with respect and attentiveness. Its Social Service Fund has, in recent years, disbursed approximately US\$113 million of medicine to medically underserved

patients for their medical assistance and required living expenses and assisted living expenses when needed. Furthermore, the case hospital system has sponsored specifically cochlear implants, stem cell transplantations, and other medical devices that improve the basic quality of life of its socially disadvantaged patients. The case hospital system also collaborated with NHI in offering free clinics to the indigent populations. Table 3 lists the investments of the case hospital system when generating these social and financial values for the underserved populations during the years of 2008 to 2010.

Both the financial and social successes of the case hospital system have drawn more attention from the government and the existing establishments in the public sector. A multitude of foundation-owned hospitals fluxed into the market following the case

Table 3. Social Value Generated for the Underserved Populations, 2008–2010

| Year | Medical assistance to the socially disadvantaged | | Free Clinic | |
|------|--|--------------------|-------------|----------------|
| | US\$ (M) ^a | Persons Served (M) | US\$ (K) | Persons served |
| 2008 | 5.900 | 1.030 | 3.333 | 817 |
| 2009 | 10.364 | 1.590 | 8.000 | 2607 |
| 2010 | 18.209 | 4.020 | 31.333 | 10065 |

^aUS\$1 is roughly equivalent to NT\$30 from 2008–2010.

system's example in late 1970s to the 1980s. The government responded to this market force by establishing a new legal entity of hospitals in 1987 and allowing enterprises to establish nonprofit foundation-owned hospitals with endowment funds; these hospitals were later regulated under the jurisdiction of the Department of Health instead of the Ministry of Internal Affairs. This policy change quickly led to an even more significant increase in this segment, and the resulting keener competition compelled providers to use more advanced medical technology to attract patients. One informant stated: "We believed that health insurance for all the workers on the Island is essential and led the negotiations with the public insurance organization. Once the agreement was reached, other foundation- and faith-based hospitals followed suit."

Figure 2 delineates the constructs that were discerned and evidenced in the case study. The socially focused entrepreneurial practices are instigated by the entrepreneur's market-orientated response to the environmental challenges (such as providing care to underserved populations and implementing policies to ensure quality of care), and this is facilitated by the management's shared social mission of generating social benefits and providing affordable quality of care. The multidimensional outputs of social capital and enterprise value further drive the creation of social and financial value.

Discussion

Health care as a social service has encountered major challenges globally in an environment with limited resources and widening social disparity. According to Tiku (2008),⁴⁶ a market's operational needs may sway the socially driven entrepreneurs

toward becoming more market driven, whereas those who start with a more market-driven idea may develop more socially conscious practices as a result of the market demands. The findings of this case study show that the volatile environment must be coupled with market-oriented organizations to lead to entrepreneurial practices in the health care context. The positive financial output of such a business model then attracts the influx of competitors/providers. The continuously changing environment, policies (such as the tax status and regulations, insurance and payer systems) and the norm/philosophy of operations resulted in further expansions of privately owned general hospitals. Figure 3 illustrates both the steady growth of the health care sector and the provision of health care to the local population. During the period from 1960 to 2010, the number of hospital beds in the private sector grew from 30 percent to 66.04 percent, a sector in which foundation-owned hospital systems accounted for 69.14 percent of the whole. The provision of health care in terms of beds available improved from 0.7 beds per 1,000 people to 5.8 beds. This phenomenon illustrates the importance of the social entrepreneurs and their leadership teams as the driving force for fostering an "ethics-grounded" culture,⁴⁷ one in which the social entrepreneurial processes resulted in outputs that encompass both financial and social outcomes as well as having a direct impact on policies.⁴⁸ The case hospital system constantly operates in a fluctuating and uncertain context, and this presented a distinct opportunity for the organization to instigate a social movement that exerted strong influences on its public and political environments. Through its entrepreneurial practices of using social and enterprise capital, the

Figure 2. Key Components of the Social Entrepreneurial System of the Case Hospital System

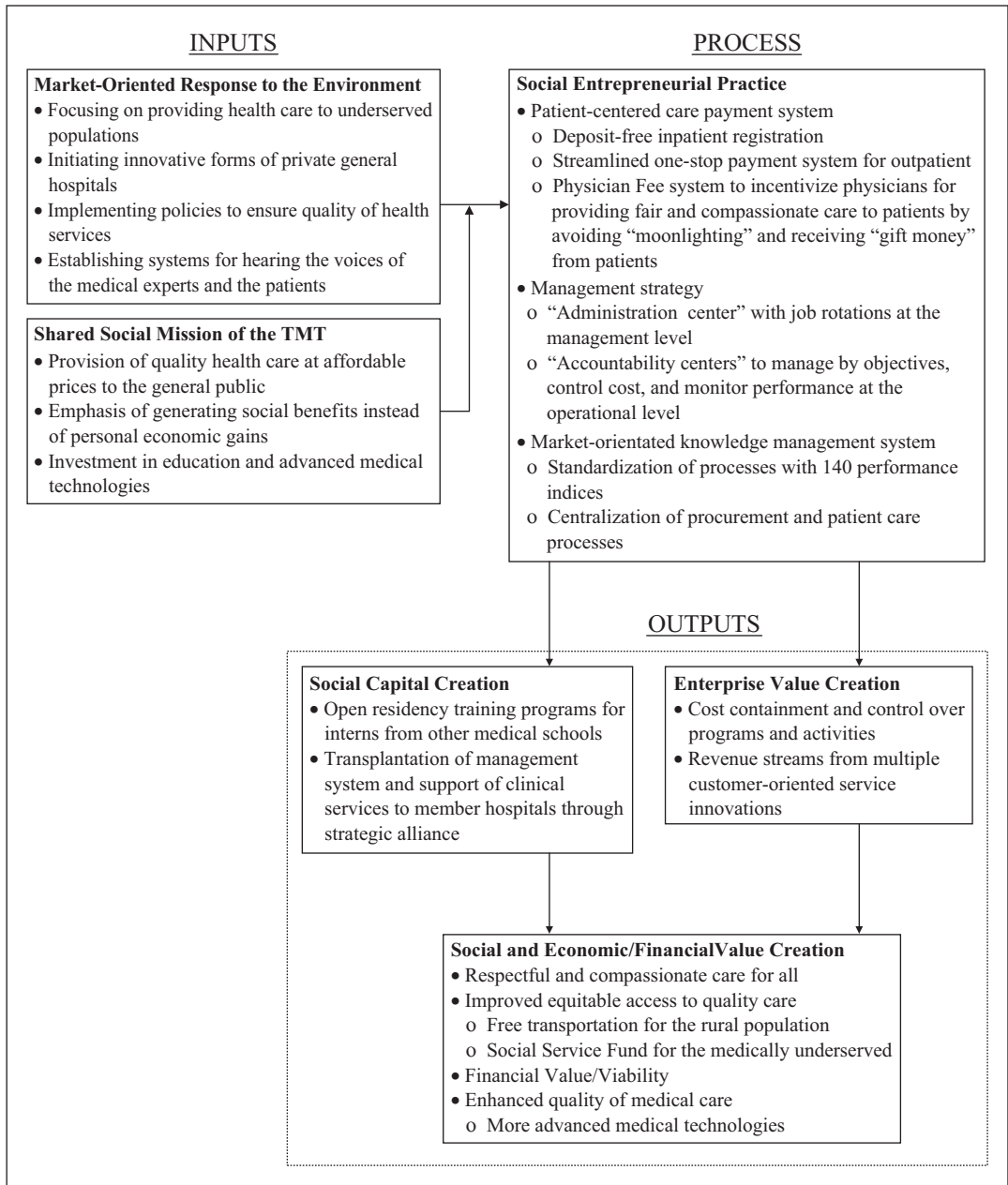
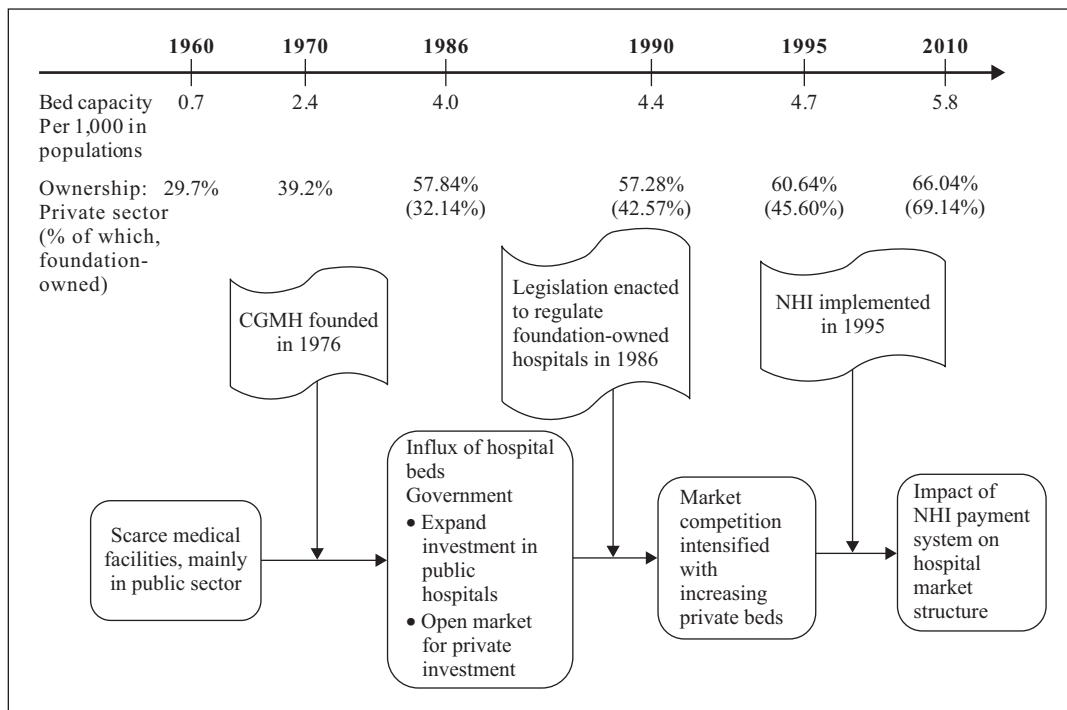


Figure 3. Evolution of the Hospital Market in Taiwan, 1960–2010



result led to social value that benefits the general public and financial value that is advantageous for the organization itself. Furthermore, by building social capital, entrepreneurs are enabled to play a strong role in making an impact on the policy/public environment that eventually allows a much more powerful social value creation through fundamental social change.

The health care industry is in transition throughout the world. Health care reforms in the United States and other emerging economies, such as China, present an environment that is constantly changing and uncertain. The entrepreneurial orientation of the leaders of health care organizations and policy makers is shown to be an important drive for translating business principles into the development of more sustainable business models

and processes in the health care context. For instance, bundled care models and accountability care organizations in the United States and privatization of hospitals in China⁴⁹ are examples of entrepreneurial practices. Other scholars also recommend the formulation of networks to influence complementary or even competing organizations to mobilize their resources toward activities across organizational and sector boundaries to lead to maximal social impact.⁵⁰

To achieve these goals, hospital leaders should focus their efforts internally to attain support from their boards while continuing to engage in dialogues with external stakeholders as well as in advancing the social mission of their hospital. The innovative management system and business model of the case hospital system have shown to exert

profound impacts on their counterparts in the public sector and within the health care market as a form of positive externality. Consequently, the government has actively responded to their evidence-based paradigm shifts in practice through on-going policies changes. Nonprofit health care organizations usually have a clear social mission, but they are often unable to fully appreciate the extent to which they may generate social values for the public at large. This case study provides an element of the initial evidence of real impact that such steps taken in the nonprofit health care market may hold. The financial viability of the case hospital system has motivated other health care institutions in Taiwan, China, and Asia at large to emulate its business model.

Conclusion

Socially driven entrepreneurial organizations are built to achieve change but most

of them focus only on their social causes regardless of cost.⁵¹ However, in this study, we demonstrated that a nonprofit organization can adopt business principles that emphasize both financial and social value. Using a case hospital system in Taiwan, we tested our model and found comprehensive accountability across departments throughout the hospital system. This led to sustainable and continual growth of the organization. Consequently through social entrepreneurial practices, we have shown that both financial value creation and fulfilling the social mission for the case hospital system can be achieved. In future studies, we intend to test our model derived from the taxonomy presented in Figure 1 with the purposes of demonstrating that applying entrepreneurial practices to the health care industry can produce positive financial and social impacts as well as guide the direction of organizational and government policy changes.

REFERENCES

1. Tuckman, H, Chang, C, "A methodology for measuring the financial vulnerability of charitable nonprofit organizations," *Nonprofit and Voluntary Sector Quarterly*, 20:445-460 (1991).
2. Fischer, RL, Wilsker, A, Young, DR, "Exploring the revenue mix of nonprofit organizations: Does it relate to publicness," *Nonprofit and Voluntary Sector Quarterly*, 40:662-681(2011); Sullivan Mort, G, Weerawardena, J, Carnegie, K, "Social entrepreneurship: Towards conceptualization," *International Journal of Nonprofit and Voluntary Sector Marketing*, 8:76-88 (2003).
3. Griffith, JR, "Finding the frontier of hospital management," *Journal of Health Care Management*, 54(1):57-73 (2009).
4. Guo, KL, Buss, TF, "Entrepreneurship in health and human services organizations: A symposium," *Journal of Health and Human Sciences Administration*, 28:468-471(2006).
5. Austin, JE, Stevenson, H, Wei-Skillern, J, "Social and commercial entrepreneurship: Same, different, or both?" *Entrepreneurship: Theory & Practice*, 30:1-22 (2006); Dees, GJ, Anderson, BB, "For-profit social ventures," *International Journal of Entrepreneurship Education*, 2:1-26 (2001); Weerawardena, J, Sullivan Mort, G, "Investigating social entrepreneurship: A multidimensional model," *Journal of World Business*, 41:21-35 (2006).
6. Campbell, S, "Social entrepreneurship: How to develop new social-purpose business

- venture," *Health Care Strategic Management*, 16:17–18 (1998).
7. Lu, JR, Chiang, T, "Evolution of Taiwan's health care system. Health Economics," *Policy and Law*, 6(1):85–107 (2011).
 8. Covin, JG, Slevin, DP, "A conceptual model of entrepreneurship as firm behavior," *Entrepreneurship Theory and Practice*, 1:7–25 (1991).
 9. Weerawardena and Sullivan Mort, *supra*, n.5.
 10. Grenier, P, "The function of social entrepreneurship in the U.K," available at: <http://www.istr.org/conferences/capetown/volume/grenier.pdf> (2002).
 11. Dees and Anderson, *supra*, n.5; Austin, et al., *supra*, n.5.
 12. Euske, NA, Euske, KJ, "Institutional theory: Employing the other side of rationality in non-profit organizations," *British Journal of Management*, 2:81–88 (1991).
 13. Kohli, AK, Jaworski, BJ, "Market orientation: The construct, research propositions, and managerial implications," *The Journal of Marketing*, 54:1–18 (1990).
 14. Hurley, RF, Hult, GTM, "Innovation, market orientation, and organizational learning: An integration and empirical examination," *The Journal of Marketing*, 62:42–54 (1998).
 15. Liu, SS, Luo, X, Shi, Y, "Integrating customer orientation, corporate entrepreneurship, and learning orientation in organizations-in-transition: An empirical study," *Journal of Research in Marketing*, 19(4):367–383 (2002).
 16. Eikenberry, AM, Kluver, JD, "The marketization of the nonprofit sector: Civil society at risk?" *Public Administration Review*, 64:132–141 (2004).
 17. Weerawardena and Sullivan Mort, *supra*, n.5; Grenier, *supra*, n.10.
 18. Guo, KL, "Entrepreneurship management in health services: An integrative model," *Journal of Health & Human Services Administration*, 28:504–530 (2006); McCleary, KJ, Rivers, PA, Schneller, ES, "A diagnostic approach to understanding entrepreneurship in health care," *Journal of Health & Human Services Administration*, 28:550–577 (2006).
 19. Dees and Anderson, *supra*, n.5; Austin, et al., *supra*, n.5.
 20. Dees and Anderson, *supra*, n.5; Mair, J, Mart, I, "Social entrepreneurship research: A source of explanation, prediction, and delight," *Journal of World Business*, 41:36–44 (2006).
 21. Austin, et al., *supra*, n.5.
 22. Grenier, *supra*, n.10.
 23. Hambrick, DC, Mason, PA, "Upper echelons: The organization as a reflection of its top managers," *Academy of Management Review*, 9:193–206 (1984).
 24. Sinkula, JM, Baker, WE, Noordewier, T, "A framework for market-based organizational learning: Linking values, knowledge, and behavior," *Journal of Academy of Marketing Science*, 25:305–318 (1997).
 25. Mair and Mart, *supra*, n.20.
 26. Venkataraman, S, "The distinctive domain of entrepreneurship research: An editor's perspective," In J. Katz and R. Brockhaus (Eds), *Advances in Entrepreneurship, Firm Emergence, and Growth*, CT: JAI Press: Greenwich (1997).
 27. Brooks, AC, *Social entrepreneurship: A modern approach to social value creation*, NJ: Pearson Prentice Hall (2009).
 28. Kent, CA, Anderson, LP, "Social capital, social entrepreneurship and entrepreneurship education," *International Journal of Entrepreneurship Education*, 2:1–18 (2002).
 29. Leana, CR, van Buren, HJ, "Organizational social capital and employment performance," *Academy of Management Review*, 24:538–555 (1999).
 30. Burt, RS, *Structural holes*, Cambridge, MA: Harvard University Press (1992).
 31. Putnam, RD, "Tuning in, tuning out: The strange disappearance of social capital in America. PS," *Political Science and Politics*, 28:664–683 (1995).
 32. Luo, X, Griffith, DA, Liu, SS, Shi, YZ, "The effects of customer relationships and social capital on firm performance: A Chinese business illustration," *Journal of International Marketing*, 12(4):25–45 (2004).
 33. Stake, RE, Case studies in Denzin, NK, and Lincoln, YS, (Eds.), *Handbook of Qualitative Research*, CA: Thousand Oaks: Sage (1994).
 34. Patton, MQ, *Qualitative Evaluation and Research Methods (3rd ed.)*, CA: Newbury Park: Sage (2002).
 35. Kohli, AK, Jaworski, BJ, Kumar, A, "MARKOR: A measure of market orientation. *Journal of Marketing Research*, 30(4):467–477 (1993).

36. Lu and Chiang, *supra*, n.7.
37. Lu, JR, Hsiao, WC, "Does universal health insurance make health care unaffordable? Lessons from Taiwan," *Health Affairs*, 22:77–88 (2003).
38. Lu and Chiang, *supra*, n.7.
39. Wu, D, *An ideal state—Dr. Delon Wu's memoir*. Taipei: Family Art Collection Co., Ltd: (in Chinese) (2004).
40. *Id.*
41. Lu, JR, Wu, S, Chuang, Y, Chang, Gung, "Memorial Hospital: The 43.55 percent puzzle for the performance and costing of the Department of Ophthalmology," *Chang Gung University College of Management teaching case collection* (2004).
42. *Id.*
43. Chuang, Y, Hwang, C, *Health service management series – management system in health care organization*, Taipei: Farseeing Publishing Co., Ltd (2000).
44. Kong, W, "2011 Annual Report of Chang Gung Memorial Hospital," January (2011).
45. Lu, *et al.*, *supra*, n.41.
46. Tiku, N, *Do-gooder finance: How a new crop of investors is helping social entrepreneurs*. INC. Magazine, February, 29–30 (2008).
47. Nelson, WA, Donnellan, J, "An executive-driven ethical culture," *Health care Executive*, Nov/Dec:44–46 (2009).
48. Brooks, *supra*, n.27.
49. Haglund, R, "Bundled care model at Spectrum Health may be roadmap for reduced health care costs," available at: <http://www.craigslist.com/apps/pbcs.dll/article?AID=/20100915/C03/100919947/0&template=printart&template=printart&template=printart> (2010).
50. Brooks, *supra*, n.27; Wei-Skillern, J, "Networks as a type of social entrepreneurship to advance population health," *Preventive Chronic Disease*, 7:1–5 (2010).
51. Light, PC, "Social entrepreneurship revisited," *Stanford Social Innovation Review*, Summer Issue:21–22 (2009).

Health Care Reform and the Development of Health Insurance Plans: The Case of the Emirate of Abu Dhabi, UAE

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Introduction: The Emirate of Abu Dhabi has taken concrete steps to reform health insurance by improving the access to health providers as well as freedom of choice. The health system in Abu Dhabi is self-financed through universal mandatory health insurance for all residents that has three main sources of financing: employers or sponsors, the government, and individuals.

Objectives: This article explores and discusses the policy inherent in private health care schemes that have been implemented by the Emirate of Abu Dhabi.

Methods: Data was collected in early 2013 on health care plans in Abu Dhabi. The authors provide descriptive statistics to examine the progress and outcome of the introduction of the health insurance scheme to Abu-Dhabi.

Results: The Abu Dhabi model has private sector involvement but the government sets prices and benefits. The Abu Dhabi model adequately deals with the problem of adverse selection through making insurance coverage a mandatory requirement. There are issues with moral hazards, which are a combination of individual and medical practitioner behavior that might affect the efficiency of the system. Over time there is a general increase in the usage of medical services, which may be reflective of greater awareness of the policy and its benefits as well as lifestyle change.

Conclusion: Although the current health care system level of usage is adequate for the current population, as the level of usage increases, the government and other market participants may face an increase in their financial burden in premiums, deductibles, and the amount of co-pays. The Emirate might need to explore the best model to sustain affordable, quality, health care services in either imposing a single-payer system, or government/public healthcare system. The other policy option is to introduce competition to the health care market, which is not easy to implement due to the nature of the health care sector in comparison to other sectors of the economy. Additional policies should be considered, such as adopting educational programs to encourage the population to conduct a healthy lifestyle and encourage precautionary actions.

Key words: *health system, health finance, health insurance, health plan, Abu Dhabi UAE*

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1. Introduction

Efficient and effective health care is the cornerstone in the development of any country and most western governments during the post-war period sought to provide a state-run system. Under the state run health care system all individuals receive access to health care services. However, the last 60 years have shown that health care is an area fraught with many challenges. Health care by its nature is impacted by the increasing cost of care, infrastructure, and medicines.¹ In most countries health care inflation tends to be well above the general inflation level. As a direct result health care expenditure as a proportion of GDP has been increasing in most developed countries.² At the same time, medical advances have allowed for an increase in the life expectancy of individuals, which has meant that governments now need to spend more money on long-term care. The growing cost of health care and the impact of the global financial crisis have meant that many countries are no longer able to solely bear the cost. As a result many countries have sought to overhaul their health care system and introduced some market-based system to share the burden of provision with consumers, the private sector, and employers.³

The difference between the private and public sector is that the former requires a financial return on its investment while the latter tends to be operated as a nonprofit organization. Therefore, the involvement of the private sector in the provision of health care plans invariably implies that there will be coverage but at a cost. The usual scenario is that low-risk individuals or those who can afford to pay tend to receive medical coverage while those who are at high risk or cannot afford to pay are excluded from the system. Due to this market failure governments have

tended to employ a safety net such as the US Patient Protection and Affordable Care Act, enacted in 2010, which seeks to increase access by making insurance available to the 50 million Americans that are excluded from public or private coverage.⁴ Market failure in the health care sector is also an important area for developing countries especially those that are resource rich and have a relatively small population. One such example is that of the UAE emirate of Abu Dhabi, which sought to ensure that all residents whether national or expatriate have medical insurance by making it compulsory for employers to provide a health care plan for their employees and families. The UAE is a small country yet abundant with resources that allows it to easily afford to not only extend its provision of medical services but also allows for a state-run health care system. However, two policy issues arise. First, the emirate of Abu Dhabi has to decide which government expenditures to prioritize and which can be covered by the private sector. Second, the emirate of Abu Dhabi like the rest of the UAE has a particular problem in that the nationals are a minority while the majority are expatriate workers and their families.⁵ In such a situation a government-funded program will benefit nonnationals more than nationals.

Within the UAE, the emirate of Abu Dhabi was the first to introduce a compulsory health insurance scheme for all residents of the emirate in 2007. This insurance is financed by premiums shared between employers and employees, copayments, and coinsurances. The system was flexible so as to allow residents of the other six emirates within the UAE to join on a voluntary basis. The compulsory insurance scheme was extended in 2008 when the Health Authority of Abu Dhabi (HAAD) established the Thiqa program for UAE

nationals managed by the National Health Insurance Company (DAMAN). The unusual aspect of this health care plan was that it was mandatory for all UAE nationals to subscribe to but was provided free of charge. Furthermore, this particular health care plan had an extensive range of benefits and coverage.

In the post-global financial crisis environment, private health care insurance appears to be a favored route for governments to promote. For policy makers, private health care insurance allows them to provide financial protection for their citizens through prepayment while at the same time creating a risk-pooling mechanism that permits providers to make a return.⁶ However, for providers to make a return they need to ensure that they can implement cost-control mechanisms, which may include thinner benefits, increased copayments, and higher deductibles. From a consumer perspective these reductions in benefits and increased copayments may not be aligned with their wants. The experience of many countries shows that over time consumers tend to demand a greater variety of options. As a result, health care plans may start off being the same but due to multiple benefit configurations and choice of provider networks they can develop into a large portfolio of schemes.

Insurance markets by their nature are subject to various market failures, which open up government policy issues. The aim of this article is to examine the government policy implications that arise from the move towards a compulsory health care coverage system. In some countries these policy issues have been dealt with through direct government intervention so as to promote the public health aims and objectives of equity, affordability and access to

comprehensive health services. Through implementing appropriate government policies or intervention strategies such as incentives and regulations they can “conscript private insurance to serve the public goal of equitable access.”⁷ As an exploratory article it does not have any prior assumption or hypothesis but simply seeks to understand how the policy issues inherent in private health care schemes have been dealt with by the emirate of Abu Dhabi. At the same time, the article seeks to understand whether the development of the compulsory health care insurance has impacted the design and availability of policies.

This article consists of six sections of which the first introduces the issues that will be explored in this study. In the next section we describe the health care system in the emirate of Abu Dhabi. The third section explains the role of private sector insurance and the issues that typically arise that government policy needs to address. The fourth section discusses the aspects of the available health care plans in the emirate of Abu Dhabi. The fifth section discusses the policy issues in the context of Abu Dhabi’s experience. Finally, the sixth section provides the conclusions and recommendations.

2. The Health Care System in Abu Dhabi

The Abu Dhabi health care system consists of two main components: the Ministry of Health (MOH) and the Abu Dhabi Health Authority (HAAD); the former is a federal entity and the latter is only for the emirate of Abu Dhabi. HAAD is financed through compulsory insurance contributions in which costs are shared between employers and employees. A number of health reforms

have occurred recently to move Abu Dhabi towards achieving its vision for 2020. Some of the key changes that have taken place are:

- Mandatory health insurance was introduced starting January 1, 2007.
- The General Authority for Health Services (GAHS) was split into the Health Authority Abu Dhabi (HAAD), which is the regulatory authority, and SEHA/Health Services Sector, which manages public providers. This clear separation of roles is intended to enhance transparency and provide the basis for an open system.
- The largest public hospitals now have management contracts with international providers:
 - Sheikh Khalifa Medical City (SKMC) has a contract with the Cleveland Clinic from the US.
 - Mafraq Hospital has a contract with Bumrungrad from Thailand.
 - Al Ain Hospital has a contract with VAMED from Austria.
 - Tawam Hospital has a contract with Johns Hopkins from the US.

The health system finances itself through mandatory health insurance for all Abu Dhabi Emirate residents. Providers are independent and predominantly private. The private sector receives its financial support from contributions by nationals and expatriates seeking their health services through mainly out-of-pocket payment.

2.1 Providers

Public providers are bundled under the SEHA umbrella and control a market share of roughly one-third of the outpatient and two-thirds of the inpatient sector. In addition to the

revenue they generate from insurance, they get direct funds from the Abu Dhabi Department of Finance both for ongoing operational costs as well as for capital projects. Most of the larger SEHA hospitals have international management partners (Johns Hopkins International, Cleveland Clinic, and VAMED, for example). The dominant private providers operate hospitals that also serve as large polyclinics for outpatient traffic, the largest of which are Al Noor and NMC Hospital. Mubadala-owned facilities, such as the Imperial College London Diabetes Center and the Molecular Imaging Center, are in between public and private. On the one hand they receive such public provider privileges as not being subject to a copayment for pharmaceuticals under the Thiqa Program; on the other hand they independently negotiate prices separately from SEHA as private facilities.

2.2 Payers

Medical insurance can be bought directly from medical insurance companies or indirectly through medical insurance brokers. In 2013, there were 39 authorized insurance providers, 50 authorized brokers, and 13 authorized third-party administrators (TPA) competing for this segment. A TPA is an organization that processes insurance claims or certain aspects of employee benefit plans for a separate entity. This can be viewed as “outsourcing” the administration of the claims processing, as the TPA tends to carry out tasks traditionally managed by the company providing the insurance coverage. The payer market consists of 39 companies and is dominated by DAMAN, which almost exclusively administers the Basic Health Insurance Plan and the Thiqa Plan. In addition, it holds the largest market share, about 30 percent of the market. Other large players are regional

companies such as Oman Insurance, ADNIC, and Green Crescent, or international groups such as AXA. Many of the smaller players outsource their administration to TPAs. The larger of these companies are NAS and Next-Care (part of Allianz Group). Although the health care insurance market in Abu Dhabi has increased to more than one million members it tends to be highly concentrated. Almost 60 percent of the market is controlled by three payers: DAMAN (28.6 percent), Oman Insurance (16.4 percent), and Abu Dhabi National Insurance Company (ADNIC) (14.5 percent).

2.3 Health Insurance Plans in Abu Dhabi

There are four broad categories of health insurance plans in Abu Dhabi: Thiqa, Basic, Enhanced, and Visitor. In addition to the Thiqa program, which is specifically for nationals, laws and regulations established three types of private health insurance plans that can be sold to nonnationals:

1. The Basic product, for individuals with limited income and the dependents of nonnationals who are not eligible to be covered by the nonnational's employment-based insurance.
2. The Enhanced product, for individuals above the income threshold set by the regulations for the Basic product and available to all nonnationals.
3. The Visitor product, for visitors to the Emirate holding certain types of visas.

2.3.1 Basic Health Insurance Plan

The basic plan is for expatriates with a total monthly salary package of under or equal to AED 4,000 (US\$1,090) with housing allowance, or AED 5,000 (US\$1,363) when housing is not provided by the employer. Nonnationals must enroll in the basic plan as

mandatory minimum coverage offered at the government-subsidized price of AED 600 (US\$163) per year, a premium that is determined by an executive decision from HAAD and administered by DAMAN and the other 11 insurance companies. HAAD sets the reimbursement rate (that is, the standard tariff), and approves the price list for services covered in the basic plan. Employers are required to provide health insurance to all expatriate employees, their spouses, and up to three children (under age 18). Gulf Cooperation Council (GCC) nationals are exempt from this requirement. Expatriate employees' health insurance must provide basic coverage including hospitalization, medical exams, treatment, primary care, tests, X-rays, dental care (excluding orthodontics and dentures), prescription drugs, and accommodation fees for family members or other caregivers.

The maximum limit for basic health services per insured person (that is, the ceiling) is AED 250,000 (US\$68,120) annually. The plan levies a deductible of AED 20 (US\$5.50) per outpatient visit to the general practitioner, and AED 10 (US\$2.25) for a specialist when referred by an approved general practitioner. The plan also levies a copayment of AED 10 (US\$2.25) per laboratory test or radiology diagnostic services (including MRI & CT). In the case of pharmaceuticals the patients need to pay 30 percent (the coinsurance amount), which is capped at AED 1,500 (US\$411) per year after which the insurer must pay the full charge of the prescription. The policy is limited to the emirate of Abu Dhabi although emergency cases are covered in the whole of the UAE. Furthermore, the policy provides maternity coverage at full cost within the network with an AED 500 (US\$137) deductible for each delivery.

2.3.2 *Enhanced Health Insurance Plan*

Expatriates who are not eligible for the basic plan can obtain medical coverage through purchasing the enhanced plan. Under the regulations, insurance providers that offer the enhanced policy cannot exclude any of the benefits that are available under the basic policy. In addition to what is offered in the basic policy, insurance providers are required to make available a minimum of two significant enhancements, such as increasing the upper limit coverage, geographical area, inpatient services, outpatient services, and so on. For outpatient services, one of the following two options may be selected: Option (1) remove the deductible amount or coinsurance on all the elements of the outpatient health care services and keep the coverage for pharmaceuticals at AED 1,500 per year; or Option (2) increase the coverage for pharmaceuticals to AED 3,000 per year with a coinsurance of 15 percent. Also, providers cannot restrict the upper age limit for insurance coverage. Finally, the amount of the deductible cannot exceed a maximum of AED 50 for outpatient services other than medicines.

The premium for the enhanced policy is to be determined by market rates and is based on many factors such as age, gender, maternity and dental coverage, geographical coverage, and medical conditions or preexisting diseases. Members older than 55 years or children younger than 7 months need to submit a medical report describing their health status. DAMAN covers dental treatment for groups who are part of enhanced plans such as UAE Regional, International, and Global Plans. For individuals, dental services can be added only to International and Global plans.

2.3.3 *Thiqa Health Insurance Plan*

Thiqa is administered by the national health insurance company, DAMAN, and is regulated by HAAD. Thiqa Health Insurance Program is provided to all UAE nationals working and residing in the emirate of Abu Dhabi with comprehensive, free health care coverage at all public and private hospitals registered within DAMAN's network. All Thiqa members can use health care services from more than 1,600 medical providers including health care facilities in the emirate of Abu Dhabi and facilities outside the UAE for emergency cases. Thiqa members are eligible to receive outpatient coverage, day treatment, and inpatient coverage with a private room with one bed. About 400,000 citizens are covered under this scheme as of 2013.

DAMAN, a government-owned, specialized health insurance company that was set up in 2005 was assigned to manage the Thiqa plan. The program is provided by the government of Abu Dhabi through the Department of Finance. UAE nationals through Thiqa Health Insurance Program have the following benefits:

- Services provided outside the emirate of Abu Dhabi are subject to 10 percent coinsurance.
- Nationals pay a coinsurance of 50 percent for dental treatment and pharmaceuticals in all private-sector facilities.
- Pharmaceuticals are free if prescribed in a private facility but obtained in a public facility.
- The maximum limit for health services per insured person (that is, the ceiling) is AED 500,000 (US\$137,000) per year.

- The territorial limit of the policy is restricted to the UAE.
- Emergency cases are covered in a specified list of countries.
- Maternity is fully covered within network.
- Dental benefits are fully covered within network with no coverage outside network.
- Second opinion service is provided by Europe Assistance GCS.
- Annual Breast Cancer Screening (applicable for females >35 years in designated network) is covered.
- Annual Prostate Cancer Screening (applicable for males >45 years in designated network) is covered.

UAE nationals working and living in Abu Dhabi are required to have a Thiqa card and should not purchase other health insurance plans. Employers seeking to provide their UAE national employees with more health insurance benefits can still purchase a “Thiqa Top-Up” that adds to the existing benefits of Thiqa. International Patient Care (IPC) is a scheme for treatment abroad also covered by the government. In addition, the government funds defined mandates for health care services and programs that serve the public good and that are not covered by the Health Insurance Scheme (that is, funded mandates).

2.3.4 Visitor Plans

For those on a visit visa, the visitor plan provides an aggregate limit on covered care of no less than AED 100,000 (US\$27,400). The premium is to be determined on the basis of the duration of stay and market rates. Currently, 13 companies provide visitor products. The visitor plan is provided for visitors or for those with visit visas and purchased

through their corresponding sponsors. All policies with the exception of the emergency policy are valid for at least one year and should be renewed accordingly. The insured is not entitled to claim back the premium.

3. The Concept of Private Insurance

Governments that have sought to bring in medical insurance schemes have done so on the premise that it provides citizens with access to medical care while limiting their financial exposure to the insurance premiums and the copayments that may need to be paid. The three functional components are the collection of premiums, pooling of funds, and purchasing of medical services through the establishment of a supplier network. In a post-paid system whereby the insurance company pays the customer upon receipt of the invoices there is no real need to establish a network but the essential activity of purchasing services stills exists. Technically, this pertains to whether the insurance is provided by a private or publicly owned scheme although in the latter the premiums can be collected through tax. Tax is not the only differentiating factors between a private and publicly owned scheme and Sekhri, Savedoff and Thripathi (2005) have developed three parameters that seek to understand the difference between the two as financial innovation and the need to transfer costs from governments to citizens has tended to blur the distinction between the two types of medical coverage.⁸ Sekhri, Savedoff and Thripathi (2005) have categorized the three aspects as follows:⁹

- Enrolment: whether the insurance is mandatory or voluntary.
- Underwriting/pricing: whether contributions are risk-rated (minimal risk

Figure 1. Private and Publicly Funded Insurance Schemes

| Factor | Privately Funded ← | | | | → Publicly Funded | | | | | |
|--|--------------------|-----|-----|---|-------------------|----|-----|---|-----|--------------|
| Enrollment | V | V | V | V | M | V | M | V | M | Mandatory |
| Pricing | R | R | C | C | C | I | C | I | I | Income Rated |
| Management | NPC | NPC | NPT | G | NPC | NP | NPC | G | NPC | Public |
| V=voluntary, M=Mandatory, R=Risk Rated, C=Community Rated, I=Income Rated, P=For Profit, N=Nonprofit, NPC=Nonprofit Commercial, NPT=Nonprofit Community, G=Public | | | | | | | | | | |
| Source: Sekhri, Savedoff and Thripathi, 2005. ¹⁰ | | | | | | | | | | |

transfer), community-rated (transfers between healthy and sick), or income based (transfers between higher- and lower-income individuals).

- Organizational structure: whether management of the scheme is commercial for-profit, private non-profit, or public/quasi-public.

Based on these three aspects they have developed a spectrum of different possibilities that can arise, which are illustrated in Figure 1.

Under this framework the two polar extremes are the privately and publicly funded programs. Within these two extremes one has schemes in which enrollment is either voluntary or mandatory. As the programs become publicly funded the enrollment tends to be mandatory, and, in contrast, voluntary for privately funded ones. The publicly funded programs tend to have an income-rated pricing mechanism while private ones are risk-rated. This is the key difference between the private and publicly funded programs in that the latter seek to be inclusive while the former have the room for pricing low-income individuals out of the market.

Sekhri, Savedoff and Thripathi (2005) describe a convenient framework that can help us understand the different ways in which private and public insurance schemes

operate in the case of Abu Dhabi.¹¹ What is interesting about the Abu Dhabi health-care model is that it is a mixture of a state benevolent scheme for UAE nationals under the Thiqa scheme whereby the premiums are paid by the government. DAMAN, which is the company that manages the Thiqa scheme, has exclusive access to the public providers in Abu Dhabi. Although DAMAN is owned by the government, it is operated as a commercial enterprise. At the same time, expatriates must subscribe with one of the 39 insurance providers all of whom, except for DAMAN, are privately owned. Some are nonprofit, commercial enterprises such as the UK company Bupa while others are private, for-profit companies such as ADNIC or AXA. In this respect, Figure 2 summarizes the various health care plans available in Abu Dhabi.

The unique nature of the Abu Dhabi scheme makes not only an interesting study but allows us to extend the Sekhri, Savedoff and Thripathi (2005) framework. As mentioned above, Abu Dhabi has a small population of UAE nationals and a high level of income from its investments as well as hydrocarbons. As a result Abu Dhabi is in a privileged position to fully fund medical care for its people. In addition to receiving free in-country care, UAE nationals are also

Figure 2. Summary of Health Insurance Plans

| Product | Beneficiaries | Payers | Premium | Paid by | Reach | Who sets prices |
|-----------------|----------------------|------------------------------------|--|---|------------------------------------|---|
| Basic | Low income expats | DAMAN plus 11 other companies | 600 AED | Employers, covering their employees and families (1 spouse and 3 children under 18) | Abu Dhabi (plus UAE for emergency) | HAAD: basic price list |
| Enhanced | Higher income expats | 39 insurers | Risk adjusted (largely group business) | Employers, covering their employees and families (1 spouse and 3 children under 18) | Varying | Negotiation between payer and provider. HAAD sets floor and ceiling |
| Thiqa | Nationals | Department of Finance in Abu Dhabi | Free | DAMAN, which is the TPA | UAE plus worldwide emergency | HAAD (Currently set to be the same as DAMAN Network 1) |

entitled to apply for out-of-country treatment. The out-of-country treatment is provided when such facilities and resources do not exist within the UAE. This ensures that UAE nationals receive the best treatment whether it is within or outside the country at no cost to them or their employer. As far as expatriates are concerned, the government has established an income-based approach whereby the lowest paid are subsidized and a cost ceiling is applied for the higher income individuals. This dual paternalistic approach is unique and sets it apart from all other examples globally. Figure 3 places the Abu Dhabi health care model within the Sekhri, Savedoff and Thripathi (2005) framework for comparison purposes.¹²

3.1 The need for policy intervention in the health insurance markets

Insurance markets tend to suffer from market failure, which provides a strong argument for intervention by the government either directly or through a regulator. The fundamental problem with private insurance

is that of “un-insurable risk”. That is, the risk that an insurance company is not willing to cover due to either information asymmetry, inability to control the insured individual, low profit, and so on,¹³ argues that the concept of insurable risk requires that any losses arising cannot be controlled by the insured and are purely accidental as well as unpredictable. Furthermore, the risk for a particular individual may be unpredictable, but for a population it needs to be predictable. Under these circumstances an insurance provider is able to provide affordable coverage. In the case of health care insurance, the risks to a certain extent are in the control of the individual through lifestyle and behavior, such as obesity and smoking-related cancer, for example. This implies that the current situation may not be the case in the future, leading to unpredictability in assessing the insurance provider’s risk exposure. As a result of this, health care insurance markets find it difficult to provide coverage for long-term health risks, leading to a gap in the market provision and a need for government intervention.

Figure 3. The Abu Dhabi Health Care Model

| Funding | Privately Funded ← | | → Publicly Funded | |
|--------------------|--|--|--------------------------|---|
| Nationality | Expatriates | | UAE Nationals | |
| Factor | Low Income | Higher Income | Basic | With additional benefits |
| Enrollment | Mandatory | Mandatory | Mandatory | Mandatory |
| Pricing | Government set and subsidized | Risk rated but government sets a floor and ceiling | Government set and paid | Individuals pay extra for the additional benefits |
| Management | Both private and publicly owned entities | Both private and publicly owned entities | Nonprofit public | Nonprofit public |

Typically insurers tend to have less information regarding an individual’s health than the health care provider. In order to limit their own financial exposure health care insurance providers tend to set the premiums higher than they need to be. When medical insurance is voluntary, then only those who need the coverage (that is, the sick) will purchase it even at the higher price, leading to a pool of high-risk individuals. The greater the risk, the higher the cost of the medical coverage, which will exacerbate the problem, leading to greater adverse selection. Adverse selection not only increases the payouts for the insurance company but also threatens its survival. Therefore, health care providers tend to discourage sick customers from purchasing insurance or find ways to insure only lower-risk individuals. This leaves a pool of sick individuals that have no private insurance company willing to insure them regardless of their willingness to pay for the coverage. From a public concern, government intervention is required so that all citizens receive adequate medical coverage. One of the possible interventions is to make insurance mandatory and force insurers to accept all applicants or to subsidize the cost of care for the high-risk individuals.

Health care insurance providers have found that when individuals purchase insur-

ance coverage they tend to use medical services more often than if they were not insured.¹⁴ Such an inability to control the actions of individuals after purchasing insurance is called “moral hazard.” In health care the problem of moral hazard is made worse by the fact that the medical practitioner can overprescribe medications or conduct unnecessary tests and investigations. Health care providers can take action to reduce the misuse through copayments for customers and case rates for medical providers. However, the latter may also lead to poor quality care as health care providers seek to maximize their profits. Therefore, government intervention is required to ensure that under-provision of care does not take place. At the same time government intervention needs to ensure that medical practitioners do not abuse the insurance coverage through conducting needless tests resulting in higher future premiums.

Another reason for government intervention in the provision of health care plans deals with negative externalities. For instance, from a government perspective greater access to health services is considered a merit. However, the consumption of health care services by one individual may actually have a negative impact on another. Therefore, government intervention seeks

to readdress this imbalance so that the good aspects can be promoted. Eventually, lack of access to health care affects other areas of the economy such as productivity in workplaces. Government intervention in this area can take place in the form of requiring health care insurance providers to include a package of health services that are considered to be in the public interest. This intervention can also include subsidizing the cost of health care for those on a low income.

4. Discussion

Market Failure

One of the interesting aspects of the hospital sector in Abu Dhabi is that it is highly concentrated in terms of the number of providers as well as the owners. More importantly, only one insurance company (DAMAN) is able to contract with government-owned hospitals. This has two implications. First, the level of provision offered is less than what may be possible under a fully competitive system. Second, from a patient viewpoint, not being able to use all the hospitals implies that the access to the level of treatment is not equal. Thus, there is no real competition between the hospitals and each has some level of monopolistic power. As a result, hospitals are able to charge a higher fee than they normally would with open competition. One way of increasing the level of competition in the hospital sector is simply to extend the ability of all insurance providers to contract with government hospitals. Even if there is little competition currently in the market, it is important for the present set of hospitals to know that the market is open and there could be new entrants in the near future. This type of action is referred to by Vickers and Yarrow (1988) as the disciplinary effect.¹⁵ In

our opinion, we believe that HAAD should encourage more hospitals to open in the emirate so that the disciplinary effect is strong and the benefits to the patients are realized.

From the viewpoint of patient coverage we found that the Abu Dhabi system has successfully managed to create a health care system that does not exclude any single individual regardless of age or health risk. At the same time the ceilings ensure that the lower income households are not disadvantaged through heavy deductibles and coinsurance payments. Interestingly, the Abu Dhabi system also takes into consideration the income levels of the bulk of its residents and has set a reasonable limit on pharmaceuticals. The pharmaceutical limit is currently at a point at which coinsurance is about a month's salary of an average laborer. This implies that those who need pharmaceuticals can have access to them while ensuring that their usage is carried out in a reasonable manner through codedeductibles at the lower level. As far as specialized treatment is concerned, this is available to all nationals outside the country and includes the cost of travel of one additional family member for the duration of the overseas trip.

Adverse Selection

One of the key issues in any insurance plan is the problem of adverse selection or what is sometimes referred to as negative selection. The basis of adverse selection is that there is asymmetric information between the providers of insurance and the buyers so that an individual's demand is positively correlated with his or her risk of loss. As a result one finds that those with the greatest risk of loss tend to be those that purchase insurance leaving the insurance provider with a pool of individuals that are a bad risk. In some cases the insurance provider may be allowed to correlate the

price with the risk due to government regulations. This situation is referred to as regulatory adverse selection.¹⁶ We found that regulatory adverse selection does exist in the case of the Abu Dhabi model in that insurance providers cannot set their own rates based on the individual risk profile. Also, insurance providers cannot refuse a particular individual from obtaining medical coverage based on age, or other factors. Interestingly, market access and adverse selection are conflicting issues in that the former seeks not to exclude any individual from obtaining medical coverage while the latter favors a risk-based pricing model in which some can be excluded on this basis. In the case of the Abu Dhabi model the issue of adverse selection has been reduced by creating large enough pools of individuals so that the overall portfolio risk is reduced. In the case of nationals they can purchase only the Thiqa policy through a single supplier. In this manner, we found that the average risk is reduced. As shown in Figure 4 the membership of the Thiqa policy now covers almost the entire national population of Abu Dhabi, and as such the portfolio risk is lower than it would be had the government not mandated a single company to provide such coverage. In the case of expatriates we found that as it is mandatory to have medical insurance there is equal probability that those with higher risk are spread across all the companies. However,

our analysis shows that two companies—DAMAN and ADNIC—cover almost half the expatriate population while the rest have market shares of typically 2 percent. This implies that the larger two companies have portfolios that are well diversified while the smaller providers may be exposed to greater risk. We believe that in time some of the smaller providers may find it unprofitable to be in the market and may exit. Although concentration in a regulated insurance market may not be undesirable it should nevertheless be managed, and procedures should be put in place so that individuals are covered in case of a company going out of business or being taken over.

Moral Hazard

Another important issue in insurance is that of moral hazard whereby an insurance provider cannot control the actions of the insured once the policy has been taken out. For example, individuals with insurance may have a tendency to take risks that they would not normally take because any incurred costs will not be borne by them but rather by the insurance provider.¹⁸ The essence of moral hazard lies in the insureds not taking responsibility for their actions leading to a financial loss by the insurance provider. This is a special case of information asymmetry because the insured has more information of the post-

Figure 4. Number of Members in Each Plan

| Type of Health Insurance Plan | 2008 | 2009 | 2010 | 2011 |
|-------------------------------|------------------|------------------|------------------|------------------|
| Basic | 944,344 | 936,207 | 1,204,418 | 1,322,804 |
| Enhanced | 932,610 | 981,743 | 1,044,734 | 1,053,893 |
| Thiqa | 383,795 | 394,618 | 422,239 | 442,261 |
| Total | 2,260,749 | 2,312,568 | 2,671,391 | 2,818,958 |

Source: HAAD Health Statistics 2011¹⁷

insurance behavior than the insurance provider. Two issues arise from the problem of a moral hazard in that it is a behavioral issue and not that every individual is likely to act in an irresponsible manner. The reason for this is that essentially the underlying aspect of acting irresponsibly comes down to ethics, and this differs from individual to individual. In a large portfolio there will be an averaging factor, which implies that it may suffer from individuals that act in an irresponsible behavior but also individuals that do not. The second problem is that medical providers may encourage individuals to undergo tests and treatment that are unnecessary so as to drive up their own revenue. Here, the irresponsible behavior is derived from the actions of the medical provider and not the individuals themselves. In this case the size and diversity of the portfolio cannot by itself reduce the problem of moral hazard but requires controls placed on the medical providers.

Figure 5 illustrates the inpatient and outpatient usage of medical services by the policy type. The most striking feature is that individuals on the Thiqa policy make more than four times the number of inpatient claims as do those on the basic and enhanced policy. In the case of outpatient claims it is four and half as much as the basic and three times that of the enhanced policy holders. Individuals on the basic policy visit a medical doctor for outpatient treatment about once every quarter, which increases to bimonthly for enhanced policy holders and more than once a month for those on the Thiqa policy. Such a striking difference between patient groups is unusual especially as there is an inverse correlation with income in that lower income groups use fewer medical services. This is not typical as lower income households tend to suffer from a greater level of poverty-based

illnesses. We feel that there are two reasons that may be able to explain the possible differences in usage and corresponding cost. The basic plan has deductibles that, relative to the income levels of individuals, are high. In the case of the Thiqa the deductibles are negligible compared to average income levels for that group. Therefore, we believe that the higher propensity to use medical services arises from the lack of a controlling factor. Second, medical practitioners may overencourage individuals on the Thiqa policy to revisit them for checkups, etc. The difference in the usage of medical services is an area of further research that needs to be addressed.

The second striking feature in Figure 5 is that the usage of outpatient medical treatment has increased for all policy types in the period 2009 to 2011 while inpatient treatment has remained fairly constant. We found that basic policy holders have increased their usage of outpatient treatment from about two visits a year to three while usage for those on the enhanced and Thiqa policy has increased by about 25 percent over the period 2009 to 2011. The increased usage especially for the basic policy holders we believe is largely due to a greater awareness of the policy and the services available. This may have altered the individual's behavior; previously they may have taken an over-the-counter medicine to deal with an ailment but now choose to consult a medical practitioner. We believe that with greater awareness the usage levels will increase and this may impose a financial burden as far as the subsidy is concerned. We believe that a long-term solution is to educate individuals with regard to a healthier lifestyle and taking precautionary actions.

We found that the average cost of treatment for those on the basic and enhanced policies is roughly similar. However, when

Figure 5. Usage and Claims by Policy Type

| | | Average Cost/Claim (AED) | # of Claims (1,000) | # of Claims per member | | |
|-------------------|----------------|--------------------------------|---------------------------|------------------------|-------------|-------------|
| | | 2011 | 2011 | 2009 | 2010 | 2011 |
| Inpatient | Basic | 9,006 | 38 | 0.03 | 0.03 | 0.03 |
| | Enhanced | 9,380 | 35 | 0.05 | 0.05 | 0.03 |
| | Thiqa | 12,939 | 59 | 0.18 | 0.18 | 0.13 |
| | Average | 10,861 | 131 | 0.06 | 0.06 | 0.05 |
| Outpatient | Basic | 4,138 | 154 | 2.25 | 2.43 | 3.13 |
| | Enhanced | 4,860 | 342 | 4.00 | 3.97 | 4.61 |
| | Thiqa | 6,199 | 364 | 11.2 | 13.8 | 14.0 |
| | Average | 15,197 | 300 | 4.52 | 4.84 | 5.39 |
| Both | Average | 15,328 | 390 | 4.58 | 4.90 | 5.44 |

Source: HAAD Health Statistics 2011.¹⁹

compared to the Thiqa policy there appears to be an increase of about 50 percent. As far as inpatient treatment is concerned the higher cost can be explained in terms of a single room compared with two or more patients sharing the same room. But in the case of outpatient treatment such differences should not exist as the treatment should be fairly similar. We believe that there may be evidence to support the claim that in the case of Thiqa policyholders there may be medical practitioner-induced moral hazard. In other words Thiqa policyholders may be encouraged to conduct additional tests or treatment that may not be essential.

Competition

The appendix lists all 39 providers of medical coverage in Abu Dhabi along with the types of policies offered. With such a large number of providers one would assume that there is perfect competition in the market; however, this is not the case. We found that only one company offers the

Thiqa policy covering all the nationals in the emirate. As such, nationals essentially do not have the privilege of consumer choice. In the case of the expatriate population, both basic and enhanced policy holders have a choice of 16 and 39 companies respectively. As the cost of the policy is government determined, companies compete on the basis of nonprice factors giving consumers considerable choice. This is more so the case with enhanced policies where 39 companies offer 9,450 different policies. However, we found that two companies control 46 percent of the enhanced policy market leaving a further 17 companies to control 51 percent of the market that is an average of 3 percent per company. The remaining 20 companies have about 1 percent of the market that is an average of 0.05 percent per company. It is rather unusual for two companies to dominate the market especially when the policy benefits are largely dictated by the government. Interestingly, we do not find any correlation between market dominance and the number

of plans offered or the level of coverage. We believe that there are additional factors such as “first mover advantage” or even non-market-based factors, such as customer service and ability to deal with claims, that may explain why these two companies are able to capture such a large share of the market.

6. Summary of Results, Conclusion, and Recommendations

This exploratory study was designed to analyze the provision of medical coverage in the emirate of Abu Dhabi within the framework of the Sekhri, Savedoff and Thirpathi (2005) model.²⁰ We found that the Abu Dhabi model is unique with a small local population and the need to provide the best medical treatment. As a result, the government has established a publicly owned but privately managed company to provide medical coverage to all nationals with predefined benefits at no cost and additional features to be paid by the insured. In addition, nationals receive out of country treatment when such a facility or expertise does not exist in the UAE. In the case of expatriates, two policies are available provided by 39 companies based on income levels and subsidized by the government of Abu Dhabi. As such, the Abu Dhabi model has private sector involvement but government-set prices and lists of benefits.

We found that the Abu Dhabi model seems to have dealt with the key issue of market access whereby insurance providers cannot refuse coverage for a particular individual and there exists renewal guarantee. We also found that the limits on pharmaceuticals imply that lower-income individuals are protected and can continue with their treatment without deductibles beyond a certain point.

However, we believe that as the level of usage increases and the current population ages this may pose a financial burden on the government. Although we do not propose a risk-based pricing model due to the fact that it may price out individuals, we nevertheless believe that the government needs to place safeguards in order to limit its exposure. These safeguards may be transferring the risk of the additional cost to the employers. In addition, we believe that the market for medical treatment needs to be made more competitive so as to ensure that they are not behaving in a monopolistic manner. Also, we believe that through greater competition there will be a lower likelihood of price inflation and increased probability of efficiency enhancements.

We found that the Abu Dhabi model adequately deals with the problem of adverse selection through making insurance coverage a mandatory requirement. As a result we found that the portfolio of any insurance provider to cover those who are good and bad risks and thus reducing the average exposure of the company. This is more so the case with nationals because only a single company is able to provide the Thiqa policy. We do not find that such a system negatively impacts consumer sovereignty or the ability of the individual to decide which company they wish to be insured under. Also, we believe that additional features may be restrictive as there is no competition. We believe that additional providers offering the Thiqa policy may enhance efficiency as well as the level of consumer sovereignty.

This study finds that there are issues with moral hazard in the Abu Dhabi health care model that are most pronounced with the Thiqa policy. We believe that the issue of moral hazard is a combination of individual

as well as medical practitioner-induced behavior. We found that on average Thiqa policy holders use outpatient medical services a little more than once a month compared with once a trimester and quarter for basic and enhanced policy holders respectively. We also found that Thiqa policyholders use four times the level of inpatient services compared to those on the basic and enhanced plans. We feel that this is an unusual abnormality that needs further research to understand the underlying factors as to why Thiqa policyholders have a far greater tendency to use medical services compared to the rest of the population. Finally, we found that over time there is a general increase in the usage of medical services and this may be reflective of greater awareness of the policy and its benefits as well as a change in lifestyle. We believe that with time this will impose a financial burden to the government and the Abu Dhabi government needs

to make individuals aware of a healthier lifestyle and encourage precautionary actions.

Our view is that the Abu Dhabi model has made considerable inroads in blending public as well as private provision of medical services and insurance coverage. However, we feel that the system needs to be refined so that it is more efficient while ensuring regulatory control. In this study we have outlined some of the ways in which efficiency gains can be made as well as limiting the financial exposure of the government to future costs. Regarding the issues of regulation, we believe that some oversight needs to take place to ensure that any medical practitioner-induced moral hazard is limited. We also believe that the medical insurance market requires a specialized regulator to oversee the safe and responsible conduct of medical insurance providers. We feel that a market dominated by two players and 20 companies sharing one percent of the market poses risks of corporate failure.

Appendix A: Details on Health Care Coverage

Table A1: Number of Providers and Plans

| Insurance Company | Basic | Enhanced | Visitor | Thiqa | Grand Total |
|---|--------------|-----------------|----------------|--------------|--------------------|
| Abu Dhabi National Insurance Company (ADNIC) | | 1,543 | | | 1,543 |
| Abu Dhabi National Takaful Co. P.S.C | 1 | 103 | | | 104 |
| Al Ain Ahlia Insurance Co. | | 113 | | | 113 |
| Al Buhaira National Insurance Co. - Abu Dhabi | 1 | 369 | | | 370 |
| Al Dhafra Insurance Co. | 1 | 544 | 4 | | 549 |
| AL Fujairah National Insurance Company | | 35 | | | 35 |
| AL HILAL TAKAFUL - PSC | 1 | 227 | | | 228 |
| Al Khazna Insurance Company | 1 | 298 | | | 299 |
| AL Sagr National Insurance Co. - Abu Dhabi | 1 | 252 | 1 | | 254 |
| Al Wathba National Insurance Co. (P.J.S.C) | | 292 | | | 292 |
| Al-Ittihad Alwatani General Insurance Company | | 63 | | | 63 |
| Alliance Insurance - P.S.C - Abu Dhabi | | 27 | | | 27 |
| American Life Insurance Co. | | 567 | | | 567 |
| Arab Orient Insurance Co. - P.S.C - Abu Dhabi | | 430 | | | 430 |
| Arabia Insurance Company S.A.L | 1 | 40 | | | 41 |
| Arabian Scandinavian Insurance Co. P.L.C. | 1 | 11 | | | 12 |
| AXA INSURANCE - GULF - BSC- C- ABU DHABI | | 443 | | | 443 |
| DAMAN (National Health Insurance Company) | 1 | 453 | 9 | 15 | 478 |
| Dubai Insurance Company - Abu Dhabi | 1 | 43 | | | 44 |
| Dubai Islamic Insurance & Reinsurance - AMAN | 1 | 97 | | | 98 |
| Dubai National Insurance and Reinsurance Co. | | 31 | | | 31 |
| Emirates Insurance Co. | | 375 | | | 375 |
| Green Crescent Insurance Company | | 848 | | | 848 |
| INSURANCE HOUSE-PSC | 1 | 64 | | | 65 |
| Islamic Arab Insurance Company - SALAMA | | 44 | | | 44 |
| Methaq Takaful Insurance P S C | | 120 | | | 120 |
| National General Insurance Co. (P.S.C) | | 202 | | | 202 |
| NOOR TAKAFUL FAMILY - PJSC - Abu Dhabi | | 72 | | | 72 |
| Oman Insurance Company Limited – Abu Dhabi | | 817 | | | 817 |
| Qatar Insurance Co. – Abu Dhabi | | 214 | | | 214 |
| Ras Al Khaimah National Insurance Co. - Abu Dhabi | | 98 | | | 98 |
| Royal & Sun Alliance Insurance (Middle East) | | 203 | | | 203 |
| Saudi Arabian Insurance Company Ltd | | 118 | | | 118 |

Continued ...

| Insurance Company | Basic | Enhanced | Visitor | Thiqa | Grand Total |
|--|--------------|-----------------|----------------|--------------|--------------------|
| Sharjah Insurance Co. - Abu Dhabi Branch | 1 | 10 | | | 11 |
| Takaful Emarat Insurance P.S.C - Abu Dhabi | 1 | 126 | | | 127 |
| Union Insurance Company - Abu Dhabi | 1 | 28 | | | 29 |
| United Insurance Company | 1 | 75 | | | 76 |
| Watania (National Takaful Company) | | 37 | | | 37 |
| Zurich Insurance Middle East S A L-Abu Dhabi | | 18 | | | 18 |
| Grand Total | 16 | 9,450 | 14 | 15 | 9,495 |

Source: HAAD Health Insurance Search Web site, <https://bpmweb.haad.ae/Insurance/SearchInsurance/SearchInsurance.aspx>, accessed July 1, 2013.

Table A2: Average Annual Coverage in the UAE (AED)
(Conversion: US\$1 = AED 3.65)

| Insurance Company | Basic | Enhanced | Visitor | Thiqa | Grand Total |
|---|--------------|-----------------|----------------|--------------|--------------------|
| Abu Dhabi National Insurance Company | | 732,404 | | | 732,404 |
| Abu Dhabi National Takaful Co. P.S.C | 250,000 | 1,126,881 | | | 1,118,450 |
| Al Ain Ahlia Insurance Co. | | 2,743,615 | | | 2,743,615 |
| Al Buhaira National Insurance Co. - Abu Dhabi | 250,000 | 331,911 | | | 331,689 |
| Al Dhafra Insurance Co. | 250,000 | 352,513 | 100,000 | | 350,486 |
| AL Fujairah National Insurance Company | | 262,857 | | | 262,857 |
| AL HILAL TAKAFUL - PSC | 250,000 | 476,872 | | | 475,877 |
| Al Khazna Insurance Company | 250,000 | 357,383 | | | 357,023 |
| AL Sagr National Insurance Co. - Abu Dhabi | 250,000 | 317,460 | 100,000 | | 316,339 |
| Al Wathba National Insurance Co. (P.J.S.C) | | 710,959 | | | 710,959 |
| Al-Ittihad Alwatani General Insurance Company | | 314,619 | | | 314,619 |
| Alliance Insurance - P.S.C - Abu Dhabi | | 464,815 | | | 464,815 |
| American Life Insurance Co. | | 582,606 | | | 582,606 |
| Arab Orient Insurance Co. - P.S.C - Abu Dhabi | | 6,109,784 | | | 6,109,784 |
| Arabia Insurance Company S.A.L | 250,000 | 509,800 | | | 503,463 |
| Arabian Scandinavian Insurance Co. P.L.C. | 250,000 | 309,091 | | | 304,167 |
| AXA INSURANCE - GULF - BSC- C- ABU DHABI | | 1,239,436 | | | 1,239,436 |
| DAMAN (National Health Insurance Company) | 250,000 | 10,440,033 | 122,222 | 500,000 | 10,154,903 |
| Dubai Insurance Company - Abu Dhabi | 250,000 | 3,450,837 | | | 3,378,091 |
| Dubai Islamic Insurance & Reinsurance - AMAN | 250,000 | 406,701 | | | 405,102 |

Continued ...

| | | | | |
|---|----------------|------------------|----------------|----------------|
| Dubai National Insurance and Reinsurance Co. | | 300,000 | | 300,000 |
| Emirates Insurance Co. | | 1,147,240 | | 1,147,240 |
| Green Crescent Insurance Company | | 770,578 | | 770,578 |
| INSURANCE HOUSE-PSC | 250,000 | 371,875 | | 370,000 |
| Islamic Arab Insurance Company - SALAMA | | 452,273 | | 452,273 |
| Methaq Takaful Insurance P S C | | 348,550 | | 348,550 |
| National General Insurance Co. (P.S.C) | | 441,807 | | 441,807 |
| NOOR TAKAFUL FAMILY - PJSC - Abu Dhabi | | 634,028 | | 634,028 |
| Oman Insurance Company Limited – Abu Dhabi | | 531,832 | | 531,832 |
| Qatar Insurance Co. – Abu Dhabi | | 2,126,246 | | 2,126,246 |
| Ras Al Khaimah National Insurance Co. - Abu Dhabi | | 516,423 | | 516,423 |
| Royal & Sun Alliance Insurance (Middle East) | | 4,779,906 | | 4,779,906 |
| Saudi Arabian Insurance Company Ltd | | 17,167,894 | | 17,167,894 |
| Sharjah Insurance Co. - Abu Dhabi Branch | 250,000 | 300,000 | | 295,455 |
| Takaful Emarat Insurance P.S.C - Abu Dhabi | 250,000 | 370,635 | | 369,685 |
| Union Insurance Company - Abu Dhabi | 250,000 | 316,071 | | 313,793 |
| United Insurance Company | 250,000 | 268,667 | | 268,421 |
| Watania (National Takaful Company) | | 624,324 | | 624,324 |
| Zurich Insurance Middle East S A L-Abu Dhabi | | 344,444 | | 344,444 |
| Grand Total | 250,000 | 1,716,359 | 114,286 | 500,000 |
| 1,711,135 | | | | |

Source: HAAD Health Insurance Search Web site, <https://bpmweb.haad.ae/Insurance/SearchInsurance/SearchInsurance.aspx>, accessed July 1, 2013.

REFERENCES

1. *Everybody's Business: Strengthening Health Systems To Improve Health Outcomes, WHO's Framework For Action (2007)*, http://www.who.int/healthsystems/strategy/everybodys_business.pdf, accessed 30/7/2013.
2. Erixon, F, van der Marel, E, "What Is Driving The Rise In Health Care Expenditures? An Inquiry into the Nature and Causes of the Cost Disease," *ECIPE Working Paper No. 5*, 2011, http://www.ecipe.org/media/publication_pdfs/what-is-driving-the-rise-in-health-care-expenditures-an-inquiry-into-the-nature-and-causes-of-the-cost-disease_1.pdf, accessed 30/7/2013.
3. Smith, E, Brugha, R, Zwi, A, "Working with Private Sector Providers Better Health Care: An Introductory Guide," *World Health Organization*, 2001, <http://www.who.int/management/partnerships/private/private-sectorguide.pdf>, accessed 30/7/2013.
4. Gruber, J, "The Impacts of the Affordable Care Act: How Reasonable Are the Projections?" *NBER Working Paper No. 17168*, 2011, <http://www.nber.org/papers/w17168>, accessed 30/7/2013.
5. *Abu Dhabi's Economic Performance in the Last 10 Years: Chart book (2001-2010)*, Abu Dhabi Council for Economic Development

- (2012), <http://www.adced.ae/uploads/Chart-book.pdf>, accessed 30/7/2013.
6. Sekhri, N, Savedoff, W, Thripathi, S, "Regulation Private health insurance to Serve the Public Interest Policy Issues for Developing Countries," *World Health Organization*, 2005, http://www.who.int/health_financing/regulation_private_health_insurance_dp_05_3.pdf, accessed 30/7/2013.
 7. Jost, T, "Private or Public Approaches to Insuring the Uninsured: Lessons from International Experience with Private Insurance," *New York University Law Review*, 2001, 76(2):419–492.
 8. Sekhri, et al., *supra*, n.6.
 9. *Id.*
 10. *Id.*
 11. *Id.*
 12. *Id.*
 13. Outreville, J F, "Theory and Practice of Insurance," Kluwer Academic Publishers: Boston, 1998.
 14. Dong, Y, "How Health Insurance Affects Health Care Demand. A Structural Analysis of Behavioral Moral Hazard and Adverse Selection," *Economic Inquiry*, 2011, 51(2):1324–1344.
 15. Vickers, J, Yarrow, G, "Privatisation: An Economic Analysis," Massachusetts: MIT Press, 1988.
 16. Polborn, M K, Hoy, M, Sadanand, A, "Advantageous Effects of Regulatory Adverse Selection in the Life Insurance Market," *Economic Journal*, 2006, 116 (508):327–354.
 17. Health Statistics (2011), *Health Authority Abu Dhabi (HAAD)*, <http://www.haad.ae/HAAD/LinkClick.aspx?fileticket=JY0sMXQXrOU%3d&tabid=349>, accessed 30/7/2013.
 18. Krugman, P, "The Return of Depression Economics and the Crisis of 2008," New York: W. W. Norton & Company, 2009.
 19. HAAD, *supra*, n.17.
 20. Sekhri, et al., *supra*, n.6.

The Impact of Star Physicians on Diffusion of a Medical Technology: The Case of Laparoscopic Gastric Bypass Surgery

Laura Shinn

Using data on all bariatric surgeries performed in the state of Pennsylvania from 1995 through 2007, this paper uses logistic and OLS regressions to measure the effect of star physicians and star hospitals on the diffusion of an innovation in bariatric surgery called laparoscopic gastric bypass surgery (LGBS). This paper tests for effects at both the hospital and physician level. Compared to hospitals with no star physicians (11 percent adoption rate), those with star physicians on staff show a much higher adoption rate (89 percent). Compared to hospitals that are not classified as star hospitals (13 percent diffusion rate), hospitals with star status show a much higher diffusion rate (87 percent from first quarter 2000 to fourth quarter 2001); being a star hospital raises the likelihood of that hospital diffusing LGBS from 13 percent to 87 percent. At the physician level, the empirical results indicate that star physicians exert positive asymmetric influence on the adoption and utilization rates of nonstars at the same hospital. Stars are those who: (1) graduated from a Top 30 medical school, (2) completed residency at a Top 30 hospital, or (3) are included in a Castle Connolly Top Doctors® publication. The results of this paper support earlier work on the role of key individuals in technology diffusion. It extends research on medical technology diffusion by testing a new data set for a chronic disease treatment.

JEL classifications: D2, I10, I11, L2, O33. D2 production and organizations; L2 firm objectives, organization and behavior; I10 health general; I11 Analysis of health care markets; O33 technological change: choices and consequences; diffusion processes.

Key words: production and organizations; firm objectives, organization and behavior; health general; analysis of health care markets; technological change; diffusion processes; star physicians

Introduction

Economists and sociologists have debated the role of individual, institutional, and market factors in the diffusion of technology. In medical technology, key indi-

viduals have been recognized as opinion leaders¹ who bear influential social characteristics, such as technological status,² which make them change agents³ within their peer groups, hospitals, and hospital markets.

Dr. Shinn received her BS in Economics (concentration in finance and accounting) from the Wharton School of the University of Pennsylvania. She received her MA and PhD in economics from Temple University (2011).

Her research interests include applied microeconomics, health economics, and economic education. She completed her postdoctoral research fellowship at the Center for Health Equity Research & Promotion. Her current research includes end-of-life planning for end stage renal care patients, racial disparities in the

diffusion of a medical technology, and incentives in suicide intervention.

Upon graduating from UPenn, Dr. Shinn worked as a financial analyst for an independent power developer, overseeing analysis of more than \$500 million in municipal bond and private equity investments in alternative energy projects. She became a management shareholder and pursued various business projects before returning to graduate school.

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Recently, Burke, Fournier and Prasad (hereafter BFP),⁴ have found diffusion of a medical innovation is positively related to the presence of physicians they call stars. They used 148,174 observations of angioplasty patients to trace the diffusion of coronary stents through all nonfederal Florida hospitals over the period 1995–2001, and found that star physicians influence nonstar physicians through social interactions within local peer groups. Nonstars either imitate star physicians or learn directly from them.

Huesch⁵ questions BFP's conceptual model. He cites Van den Bulte and Lilien's⁶ analysis of Coleman, Katz and Menzel's⁷ seminal work in medical technology diffusion. Van den Bulte and Lilien found no significance to physician peer effects on diffusion of a drug, after they controlled for the effects of marketers. Huesch questions (1) BFP's definition of star physician, (2) whether BFP have sufficiently controlled for hospital and hospital market factors; (3) BFP's focus on the operating physician, as opposed to the attending physician, and (4) inclusion of nonadopting stars in the model. BFP address these questions and support their findings with additional tests on their data.⁸

This paper answers the call of both Huesch and BFP for further testing of the asymmetric influence of star physicians on a medical technology diffusion. This paper presents data and analysis that provides support for BFP's finding of asymmetric influence of star physicians in a different setting, the diffusion of laparoscopic gastric bypass surgery among physicians in 166 nonfederal hospitals in Pennsylvania. BFP's definition of star is expanded to include not only residency at a top hospital, but also those physicians who graduated from top medical schools or are designated Top Doctors in a publication that

includes peer and patient input, a Castle Connolly *Top Doctors*[®] publication.⁹ A limited qualitative analysis of one market, conducted by interviewing physicians and administrators (representing about half of one market) lends some qualitative support to the star definition.

This study is conducted in two parts. In the first part, hospital level diffusion is studied. Controlling for hospital and market effects, a hospital with a star physician has a much higher likelihood of offering laparoscopic gastric bypass surgery (89 percent) than a hospital that does not have a star physician (11 percent). In the second part of the study, physician level diffusion is studied. Nonstars increase adoption and use of laparoscopic gastric bypass surgery when they operate at the same hospital as stars. Nonstars increase their utilization by 4.9 percent for every co-located star.

Medical Background

Bariatric, or weight loss, surgery can be characterized as malabsorptive, restrictive, or a combination of both. Malabsorptive surgeries reduce the body's absorption of nutrients. Restrictive surgeries reduce the body's ability to take in food. The first surgeries, performed in the 1950s were malabsorptive. The process changed very little until the 1980s. In 1991 the National Institutes of Health endorsed bariatric surgery as an effective treatment of morbid obesity.¹⁰ Since the late 1990s, the most prevalent type of bariatric surgery performed is Roux-en-Y (RYGB) gastric bypass surgery.¹¹ Gastric bypass surgery is a combination of malabsorptive and restrictive surgery. It chemically and mechanically alters the digestive system by reducing the size of the stomach and redirecting a piece of the digestive tract so that absorption of certain high-fat foods is significantly reduced. Substitutes for surgery include dieting and

drug treatments, both of which have low long-term rates of success for weight loss. Surgical treatments for obesity are clinically proven to be the most effective long-term method for resolving morbid obesity.¹²

Laparoscopic Roux-en-Y (LGBS) gastric bypass is an innovation in surgical technology that provides an alternative to open Roux-en-Y gastric bypass, which was the most widely performed bariatric procedure until 2004. Nationwide, bariatric surgery shifted to predominantly laparoscopic technique between 2004 and 2006.¹³ Laparoscopic, or minimally invasive, surgery allows surgeons to operate using laparoscopes, instruments inserted through small openings in the abdominal cavity, while observing their actions on video screens. For abdominal surgery, five or six small, 0.5 cm to 1.0 cm incisions are made instead of one 10-cm-long incision typical of traditional open surgery. Analysis of bariatric surgeries at academic medical centers show the shift from open to laparoscopic bariatric surgery is associated with lower post-surgery morbidity rates.¹⁴ Minimally invasive surgery is also attractive because, on average, it decreases hospital stays by three days, decreases patient recovery time, and decreases the risk of hospital borne infections.¹⁵

Data and Empirical Specification

Patient Data. Proprietary data from the Pennsylvania Health Care Cost Containment Council (PHC4) include 39,918 patient-level observations from each nonfederal, short-term, acute-care hospital in the state of Pennsylvania from fourth quarter 1995 through second quarter 2007. Patient information includes patient diagnoses, hospital length of stay, age, race, gender, county, and ZIP code of residence. Diagnoses include

up to eight Diagnostically Related Group (DRG) procedure codes. Procedure data for each surgery are classified according to the *International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM)*¹⁶ procedure codes: 44.31, the code for open gastric bypass surgery, and 44.38, the code for laparoscopic gastric bypass.

Bariatric Surgery in the US and in Pennsylvania

Annual rates of increase in the number of surgeries in Pennsylvania follow a pattern similar to that observed at the national level. For the US, there are dramatic increases in the number of surgeries from 1996 through 2004, followed by slower growth thereafter. In Pennsylvania, the number of surgeries increased more than ten-fold from 1996 through 2004. In Pennsylvania, the highest number of surgeries occurred in 2004, perhaps reflecting a policy change by the Department of Health and Human Services in July of that year that rescinded an earlier Medicare policy statement and formally recognized obesity as a disease for the first time. Later in the year, Medicare coverage of bariatric surgery began. In 2005 and 2006, a slight decrease in bariatric surgeries may be suggestive of the entry into the market for outpatient bariatric surgery. It may also be due to a 2006 Medicare ruling that bariatric surgery reimbursed under Medicare must be performed at a CMS-designated Center of Excellence. Moreover, the nationwide recession may have decreased the demand for surgery if patients found copayments and the lost time from work to be obstacles to surgery. In 2007, the level of surgeries rose again. Table 1 shows the number of bariatric surgeries in the US and Pennsylvania.

Table 1. US and Pennsylvania Bariatric Surgeries

| Year | US | Pennsylvania |
|------|---------|--------------|
| 1996 | – | 70 |
| 1997 | 12,203* | 198 |
| 1998 | – | 362 |
| 1999 | – | 674 |
| 2000 | – | 1315 |
| 2001 | – | 2684 |
| 2002 | 71,733 | 4128 |
| 2003 | 101,144 | 6215 |
| 2004 | 121,055 | 7119 |
| 2005 | 140,640 | 6724 |
| 2006 | 127,335 | 5746 |
| 2007 | 186,000 | 6471 |
| 2008 | 220,000 | – |

Note: Data are from the Pennsylvania Health Care Cost Containment Council and *The Annual Health Grades Bariatric Trends in American Hospitals Study* (2006, 2007, 2008, 2009 and 2010).³¹
*The US total from 1990-1997 is 12,203. Annual US totals are unavailable for 1998, 1999, 2000, and 2001.

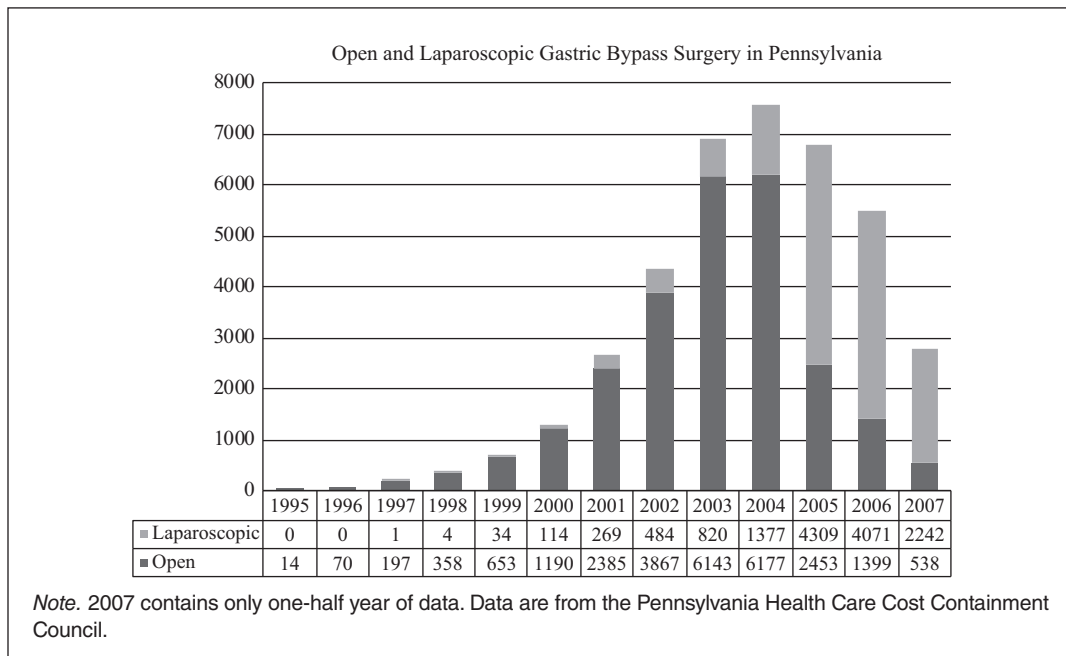
Over the time period studied, gastric bypass surgery accounted for more than 95 percent of the bariatric surgeries in Pennsylvania. Emergency surgeries and repair surgeries are excluded from the data. The number of LGBS more than doubled between 2000 and 2001, which follows the pattern of expansion of open gastric bypass surgery. Between 2004 and 2005, the number of LGBS nearly tripled, while the number of open gastric bypass surgeries declined by more than half. Surgeries changed over from predominantly open to laparoscopic by the end of 2005. Figure 1 shows the number

of open and laparoscopic gastric bypass surgeries in Pennsylvania from fourth quarter 1995 to second quarter 2007.

Hospital Data. For years 1995–2007, the PHC4's public report, *Financial Analysis, Volume 1, General Acute Care Hospitals*,¹⁷ is used to track individual and aggregate hospital characteristics. The reports include hospital size (measured in beds), hospital closures, openings, mergers and name changes. Outpatient data are excluded. Each hospital's Council of Teaching Hospital (COTH) status is obtained from the American Association of Medical Colleges' Council of Teaching Hospitals and Health Systems.¹⁸

To control for hospital market-level characteristics, a market for each hospital is defined using a variable radius technique. The 19-mile market radius used in this study is consistent with the work of Gresenz, Rogowski, and Escarce¹⁹ and Phibbs and Robinson.²⁰ Hospital characteristics that are statistically significant ($p \leq .05$) include the following: population density, number of hospitals within 15 miles, average patient length of stay, log of total charges, and hospital teaching status. Table 2 shows a comparison of the variables used in this study and the variables used by Phibbs and Robinson²¹ and Gresenz, Rogowski, and Escarce.²² Ordinary Least Squares Regressions are used to calculate the 90 percent patient flows. The radii for bariatric surgery markets in Pennsylvania compare favorably with the previous work. Nineteen and one-fifth miles is the mean patient distance to hospital, which captures 90 percent of patients. The regression is then used to predict market radii. The radius predicted is 18.7 miles. This study uses 19.0 miles to calculate the radius of a hospital's market for each hospital in the sample.

Figure 1. Open and Laparoscopic Gastric Bypass Surgery in Pennsylvania



**Table 2. Comparison of Market Radii with Earlier Studies:
90 Percent of Patient Discharges**

| | Mean | Median | Standard deviation | Minimum | Maximum |
|---------------------------------|------|--------|--------------------|---------|---------|
| Actual radius (miles) | | | | | |
| Phibbs & Robinson | 17.8 | 14.0 | 12.7 | 0.6 | 124.4 |
| Gresenz, Rogowski, & Escarce | 21.5 | 15.7 | 19.7 | 0.4 | 179.0 |
| Shinn | 19.2 | 13.4 | 18.5 | 0.1 | 97.8 |
| Predicted radius (miles) | | | | | |
| Phibbs & Robinson | 17.8 | 17.2 | 7.9 | 4.7 | 42.6 |
| Gresenz, Rogowski, & Escarce | 22.8 | 21.0 | 12.2 | 0.2 | 105.1 |
| Shinn | 18.7 | 17.6 | 8.1 | 0.0 | 45.6 |

Note: Phibbs and Robinson,³² 1983, California, 355 hospitals. Gresenz, Rogowski, and Escarce, 1997 data.³³ 9 states, 1,246 hospitals. Shinn,³⁴ 1995 through 2007, Pennsylvania, 166 hospitals. Gresenz, Rogowski, and Escarce calculate slightly large radii for rural areas. Urban area data are shown above.

Physician Data. The PHC4 proprietary data include the Pennsylvania medical license number of the operating physician, attending physician, and referring physician for each entry. Each license number is matched with the physician's name and address from the Pennsylvania Department of State database. There are 297 operating physicians. Residency, special training, medical school graduation date, and school are matched from the publicly available American Medical Association physician database. Data from *America's Top Doctors*[®] publications were graciously provided by officers from Castle Connolly Medical Limited.²³ Castle Connolly produce annual publications that rank the top 1 percent of physicians in the US according to specialty.²⁴ Physician information is also obtained from individual hospital Web sites and from phone calls and emails to individual physicians. Table 3 shows the number of physicians adopting laparoscopic gastric bypass surgery and their utilization rates, conditional on adoption.

Empirical Specification

Two models are presented. Model 1 presents diffusion at the hospital level, controlling for facility and market characteristics. The presence of a star physician at a hospital or the status of a hospital as a star hospital are shown as positively related to diffusion of laparoscopic gastric bypass surgery. Model 2 presents diffusion at the physician level. Model 2 considers behavior of nonstar and star physicians and considers the diffusion process in two parts: adoption and utilization.

MODEL 1

Does the presence of star physician(s) influence a hospital's diffusion rate of laparo-

scopic bariatric surgery technology? Do star hospitals diffuse laparoscopic gastric bypass surgery more quickly than nonstar hospitals?

Let = the log odds of hospital i diffusing laparoscopic surgery.

Let X_i = a vector of physician, hospital, and market variables. $X_i = \{ X_{i1}, X_{i2}, \dots, X_{i9} \}$. Then, the probability that a given hospital has diffused laparoscopic gastric bypass at time t is given by

$$\log \frac{P_i}{1-P_i} = Z_i = \alpha + \beta X_i + e_i \quad [\text{Equation 1}]$$

Table 4 shows Model 1 variables and descriptions. Table 5 shows variable means and standard deviations. Table 6 presents estimation results from Model 1 logistic regressions.

Discussion of Model 1 Results

Compared with a hospital that has no star physician (11 percent probability), a hospital that has a star physician has an 89 percent probability of diffusing laparoscopic gastric bypass. The result seems reasonable if the variable *doc_star* is capturing the qualities of influential individuals. From the interviews, it appears that the criteria used in this study are a reasonable proxy for star power (See Appendix 2, Description of Interviews). A shortcoming of the data is that the data include only physicians who ultimately perform bariatric surgery over the time period. Some physicians who perform general surgery learn and specialize in bariatric surgery during the study time period. Many general surgeons with the characteristics choose not to learn or specialize in bariatric surgery. Some physicians, especially by the end of the study time period, are specifically trained in bariatric surgery and make the decision

Table 3. Number of Physicians and Laparoscopic Surgeries by Quarter

| Qtr | Physicians | Cumulative Adopters (%) | Leave Sample | Enter Sample | Number Lap Surgeries | Utilization Rate |
|--------|------------|-------------------------|--------------|--------------|----------------------|------------------|
| 1999:1 | 12 | 2 | 0 | 11 | 3 | 2.70 |
| 1999:2 | 19 | 4 | 0 | 9 | 6 | 3.90 |
| 1999:3 | 26 | 4 | 0 | 5 | 6 | 3.70 |
| 1999:4 | 27 | 5 | 1 | 3 | 15 | 8.02 |
| 2000:1 | 29 | 7 | 1 | 3 | 21 | 8.61 |
| 2000:2 | 37 | 8 | 1 | 9 | 18 | 6.19 |
| 2000:3 | 37 | 10 | 1 | 2 | 24 | 7.79 |
| 2000:4 | 44 | 12 | 1 | 5 | 47 | 11.81 |
| 2001:1 | 50 | 16 | 0 | 6 | 54 | 11.09 |
| 2001:2 | 58 | 19 | 2 | 8 | 44 | 6.88 |
| 2001:3 | 66 | 21 | 1 | 5 | 75 | 11.13 |
| 2001:4 | 70 | 23 | 2 | 3 | 87 | 12.17 |
| 2002:1 | 70 | 25 | 2 | 1 | 101 | 12.29 |
| 2002:2 | 70 | 29 | 3 | 4 | 104 | 10.26 |
| 2002:3 | 76 | 28 | 3 | 4 | 146 | 12.37 |
| 2002:4 | 79 | 32 | 1 | 7 | 142 | 11.41 |
| 2003:1 | 80 | 37 | 3 | 4 | 200 | 14.30 |
| 2003:2 | 87 | 41 | 1 | 7 | 207 | 11.95 |
| 2003:3 | 94 | 48 | 1 | 8 | 227 | 12.30 |
| 2003:4 | 98 | 52 | 2 | 3 | 243 | 12.43 |
| 2004:1 | 99 | 54 | 4 | 4 | 211 | 9.94 |
| 2004:2 | 98 | 54 | 6 | 4 | 185 | 10.16 |
| 2004:3 | 97 | 52 | 4 | 2 | 309 | 15.62 |
| 2004:4 | 85 | 69 | 0 | 3 | 756 | 45.35 |
| 2005:1 | 93 | 72 | 5 | 2 | 1002 | 59.64 |
| 2005:2 | 93 | 69 | 5 | 1 | 1060 | 61.95 |
| 2005:3 | 87 | 74 | 5 | 2 | 1056 | 64.35 |
| 2005:4 | 85 | 74 | 4 | 1 | 1017 | 67.08 |
| 2006:1 | 84 | 75 | 4 | 2 | 910 | 69.89 |
| 2006:2 | 80 | 79 | 3 | 0 | 921 | 72.01 |
| 2006:3 | 82 | 76 | 3 | 2 | 865 | 66.74 |
| 2006:4 | 80 | 74 | 3 | 2 | 864 | 73.03 |
| 2007:1 | 78 | 75 | 1 | 1 | 945 | 75.60 |
| 2007:2 | 78 | 76 | 0 | 0 | 912 | 76.51 |

Note: Utilization rate is calculated as the ratio of the number of laparoscopic gastric bypass surgeries to the total number of laparoscopic and open gastric bypass surgeries.

Table 4. Model 1 Variables and Descriptions

| x_n | Variable Name | Description |
|-------|---------------|---|
| | dif_lap | Diffused laparoscopic surgery. dif_lap = 0 if hospital has not diffused laparoscopic gastric bypass; dif_lap = 1 if hospital has diffused laparoscopic gastric bypass. Diffusion is assumed if a hospital performs average of 6 surgeries per quarter for four consecutive quarters (Tian 2006). |
| X_1 | doc_star | Physician star characteristic. doc_star = 0 if physician is not star; doc_star = 1 if physician is a star. |
| X_2 | coth | Hospital star characteristic. coth = 0 if hospital is not COTH member; coth = 1 if hospital is a COTH member. |
| X_3 | beds_201 | Hospital size variable. beds_201 = 0 if hospital has \leq 200 beds; beds_201 = 1 if hospital has $>$ 200 beds. |
| X_4 | dif_op | Diffused open surgery. dif_op = 0 if hospital has not diffused open gastric bypass; dif_op = 1 if hospital has diffused open gastric bypass. |
| X_5 | lag_sat | Market competition measure. Continuous variable of each hospital's market saturation rate, lagged one quarter. |
| X_6 | hhi_type | Market competition measure. hhi_type = 1 if HHI $<$ 1500, market is competitive; hhi_type = 2 if $1500 < \text{HHI} \leq 2500$, market is moderately concentrated; hhi_type = 3 if HHI $>$ 2500, market is highly concentrated. |
| X_7 | for_profit | Hospital profit status for_profit = 0 if hospital is not for profit institution; for_profit = 1 if hospital is a for profit institution. |
| X_8 | Beds_per_1000 | Market competition measure. Continuous variable equals number of hospital beds per thousand population in the hospital's market |
| X_9 | d_op_star | d_op_star, interaction term = doc_star * dif_op |

Note: N = 5984. Mean HHI is 3,753, standard deviation 2556, minimum 462 and maximum 10,000. Mean number of beds is 219, standard deviation 176, minimum 25, and maximum 814.

to adopt bariatric surgery before they join a hospital. In this study, general surgeons who do not adopt bariatric surgery are not included. A study that includes all physicians who perform general or abdominal surgery during the time period, but who do *not* adopt bariatric surgery would likely produce less striking results.

The empirical analysis supports only a qualified statistical relationship between star hospitals and diffusion of laparoscopic surgery. This statistical outcome appears counterfactual, since COTH hospitals have been shown to account for a disproportionate share of technology-intensive hospital services. It may be that the data include a

Table 5. Model 1 Means and Standard Deviations

| X_n | Variable | Mean | Minimum | Maximum |
|-------|---------------|--------------------|---------|---------|
| | dif_lap | 0.102 (.303) | 0 | 1.00 |
| X_1 | doc_star | 0.059 (.235) | 0 | 1.00 |
| X_2 | coth | 0.187 (.390) | 0 | 1.00 |
| X_3 | beds_201 | 0.751 (.432) | 0 | 1.00 |
| X_4 | dif_op | 0.211 (.408) | 0 | 1.00 |
| X_5 | lag_sat | 8.934 (16.426) | 0 | 100 |
| X_6 | hhi_type | 2.48 (.778) | 1 | 3.00 |
| X_7 | for_profit | 0.054 (.227) | 0 | 1.00 |
| X_8 | beds_per_1000 | 3.578 (.730) | 2.380 | 4.46 |
| X_9 | d_op_star | 3.65e-11 (.067) | -.917 | .083 |

Note: N = 5984. Mean HHI is 3,753, standard deviation 2556, minimum 462 and maximum 10,000. Mean number of beds is 219, standard deviation 176, minimum 25, and maximum 814.

long enough time frame, that by the end of the time period, laparoscopic gastric bypass is no longer considered a high technology or technology-intensive service. Then, other factors, such as whether a hospital has star physicians, might become more important factors in hospital's decision to adopt and diffuse a technology. The result is statistically significant if a shorter time frame is considered. If the statistical analysis is limited to the years 2000 through 2002, then being designated a Council of Teaching Hospital (COH) increases the likelihood of a hospital diffusing laparoscopic gastric bypass surgery from 13 percent to 87 percent. It appears that, in the case of lapar-

oscopic gastric bypass surgery, the strongest statistical impact from teaching hospital status occurs in the earliest phases of use of a new technology. That is not surprising. Presumably, teaching hospitals would be expected to be leaders in most new procedures. Model 1 controls for hospital size and hospital profit status, as well as characteristics of the local market, such as market concentration (measured by HHI), market saturation rate, and a measure of market capacity. Large, for-profit hospitals are more likely to diffusion laparoscopic gastric bypass surgery. A limitation of Model 1 is that the number of stars and the interaction among peers is not measured in the model.

Table 6. Model 1: Estimation Results of Logistic Regression for Hospital Level Diffusion

| x_n | Variable Name | Coefficient (Robust Std Err) | z | P> z | Odds Ratio |
|-------|---------------|---------------------------------|-------|---------|------------|
| x_1 | doc_star | 2.051 (.488) | 4.20 | 0.000* | 7.776 |
| x_2 | coth | 0.753 (.642) | 1.17 | 0.241 | 2.120 |
| x_3 | beds_201 | 3.225 (.792) | 4.07 | 0.000* | 25.156 |
| x_4 | dif_op | 3.351 (.941) | 3.56 | 0.000* | 28.545 |
| x_5 | lag_sat | 0.123 (.015) | 8.23 | 0.000* | 1.131 |
| x_6 | hhi_type | -0.256 (.305) | -.84 | 0.402 | 0.774 |
| x_7 | for_profit | 1.693 (.599) | 2.82 | 0.005* | 5.433 |
| x_8 | beds_per1000 | -0.620 (.343) | -1.81 | 0.070** | 0.537 |
| x_9 | d_op_star | -1.510 (.913) | -1.65 | 0.098** | 0.221 |

Note: N = 5984. McFadden's R2 = .724. Wald chi(9) = 103.13. Hosmer-Lemeshow chi2(7) = 8.34. Prob > chi2 = .3039.
*p = .05, **p = .10

Model 2 addresses physician-level adoption and utilization and accounts for the interaction among stars and nonstars.

MODEL 2

Empirical Model 2 brings the analysis to the level of the individual physician behavior, concentrating on the significance of the interactions between star and nonstar physicians at co-located hospitals. Model 2 follows the methodology of Burke, Fournier and Prasad²⁵ by adding interaction terms to capture any impact on diffusion attributable to the influence from star to nonstar physicians and from nonstar to star physicians. Separate

equations are used to test the interactions: (1) on adoption and (2) on utilization.

We seek an equation describing adoption.

Let = the log odds of physician i adopting laparoscopic surgery at time t .

Let = physician's lagged number of cumulative bariatric procedures.

Let,, and = dummy variables for each physician, calendar quarter, and hospital, respectively.

Let $x_{1,rt}$ = mean patient age

Let $x_{2,rt}$ = patient gender

Let S_t = number of star peers at time t .

Let NS_t = number of non-star peers at time t .

Let gI = member of group including star physicians.

Let $g2$ = member of group including non-star physicians

Equation 2 estimates the log odds of the probability of all physicians adopting laparoscopic gastric bypass at time t .

$$z_i = p_i + c_t + \alpha_h + \beta_1 x_{1,rt} + \beta_2 x_{2,rt} + \gamma g2 * S_{rt} + \mu g1 * NS_{rt} + \delta V_{rt-1} + e_{i,t}$$

[Equation 2]

The interaction terms capture peer effects: the term captures the effect of nonstars on stars; the term captures the effect of stars on nonstars. Table 7 shows the means, standard deviations, and expected signs for the terms in the Model 2: Adoption.

We seek an equation describing utilization rates among physicians.

Let = the ratio of number of laparoscopic gastric bypass surgeries performed by a physician to the total number of gastric bypass surgeries, open and laparoscopic, performed by that same physician. Replacing with in Equation 2 yields Equation 3,

the utilization equation estimate for each physician.

$$u_{i,t} = p_i + c_t + \alpha_h + \beta_1 x_{1,rt} + \beta_2 x_{2,rt} + \gamma g2 * S_{rt} + \mu g1 * NS_{rt} + \delta V_{rt-1} + e_{i,t}$$

[Equation 3]

Table 8 shows the means, standard deviations, and expected signs for the terms in Model 2: Utilization. Tables 9 and 10 present the results of the regressions for Model 2.

Discussion of Model 2 Results

For the eight calendar quarters 2000:1 to 2001:4, the logistic regression shows a positive, asymmetric influence of star physicians on nonstar physicians. The probability of adoption increases from 4 percent for nonstars with no co-located stars to 96 percent for nonstar physicians co-located with star physicians. The utilization linear regression, conditional on a physician having adopted laparoscopic surgery, shows that utilization rates for nonstar physicians increase by 4.88

Table 7. Model 2 Variable Means, Standard Deviations: Adoption

| Variable Name | Mean (Std Dev) | Minimum | Maximum |
|---|---------------------|----------|----------|
| Adoption model (n = 101 observations) | | | |
| V_{rt-1} Lagged physician volume | 7.137 (10.912) | 0 | 46 |
| Patient gender | | | |
| Mean patient age | 42.010 (1.636) | 35.857 | 45.444 |
| S_{rt} number of stars encountered at time t | 1.543 (1.769) | 0 | 5 |
| NS_{rt} number of non-stars encountered at time t | 1.348 (1.133) | 0 | 3 |
| $grp1$ Physicians in grp1, (star) | .380 (.488) | 0 | 1 |
| $grp2$ | | | |
| $grp1nst$ $grp1 * NS_{rt}$ | .848 (1.266) | 0 | 3 |
| $grp2st$ $grp2 * S_{rt}$ | .533 (1.338) | 0 | 5 |

Note: N =101.

Table 8. Model 2 Variable Means, Standard Deviations: Utilization

| Variable Name | | Mean (Std Dev) | Minimum | Maximum |
|--|---------------------------------|------------------|----------|----------|
| Utilization model (n = 334 observations) | | | | |
| | Utilization rate | .286 (.371) | 0 | 1 |
| V_{it-1} | Lagged physician volume | 9.86 (13.64) | 0 | 100 |
| | Physicians in grp1, ("star") | .26 (.44) | 0 | 1 |
| | Mean patient age | 43.14 (2.77) | 20 | 61 |
| S_{it} | number of stars encountered | .57 (1.09) | 0 | 6 |
| NS_{it} | number of non-stars encountered | 1.05 (1.25) | 0 | 9 |
| grp1nst | grp1*nst | .39 (1.00) | 0 | 9 |
| grp2st | grp2*st | .31 (.81) | 0 | 6 |

Note: N = 334 observations.

Table 9. Model 2 Results of Logistic Regression: Adoption

| Variable | Coefficient | z | P> z | Odds Ratio | |
|------------------|---------------------------------|----------------|-------|------------|--------|
| grp2st | grp2*st | 3.106 (1.752) | 1.77 | .076 | 22.323 |
| grp1nst | grp1*nst | -3.277 (2.407) | -1.36 | .173 | .038 |
| V_{it-1} | Lagged number of open surgeries | -.229 (.115) | -1.99 | .047 | .795 |
| Dummy variables | | | | | |
| \hat{c}_t | For each quarter | | | | |
| $\hat{\alpha}_t$ | For each hospital | | | | |
| $\hat{\rho}_t$ | For each physician | | | | |

Note: N = 101.

Table 10. Model 2 Results of Linear Regression: Utilization

| Variable | Coefficient | t | P> t | |
|------------------|---------------------------------|--------------|-------|------|
| grp2st | grp2*st | .0488 (.023) | 2.14 | .033 |
| grp1nst | grp1*nst | .007 (.014) | .48 | .629 |
| | Lagged number of open surgeries | .002 (.001) | -2.27 | .024 |
| Dummy variables | | | | |
| \hat{c}_t | For each quarter | | | |
| $\hat{\alpha}_t$ | For each hospital | | | |
| $\hat{\rho}_t$ | For each physician | | | |

Note: N = 334.

percent for every one co-located star physician above the average number of co-located stars. As expected, the coefficient reflecting the influence of nonstars on stars is not statistically significant. Stars (group 1) are not statistically influenced by the presence of nonstars. The control variables for physician, hospital, calendar quarter, patient age and gender are not statistically significant.

Conclusions

This paper examines the role of star power in the diffusion of a medical technology. Certain physicians and hospitals are considered to be stars, that is, highly attractive to patients. In the case of physicians, stars are defined as those who have graduated from a Top 30 Medical School or completed a residency at a Top 30 Hospital, or are included in Castle Connolly's *Top Doctors*[®] publications. In the case of hospitals, stars are defined as members of the American Association of Medical College's Council of Teaching Hospitals. The suitability of the proxy measures is substantiated by interviews with physicians and administrators. The empirical results indicate that hospitals with star physicians and hospitals that are stars are more likely to diffuse bariatric surgery than hospitals without such characteristics. The empirical results indicate that star physicians exert positive asymmetric influence on the adoption and utilization rates of nonstars at the same hospital.

Two areas in which this study supports and extends earlier research in technology diffusion: (1) finding positive evidence for the role of key individuals, "stars," and (2) finding evidence for the role of market and institutional factors in technology diffusion. Recent work by Burke, Fournier, and Prasad²⁶ emphasize the role of social learning by testing the role of star physicians in diffusion of a technology

to nonstar physicians. This study supports Burke, Fournier, and Prasad's findings by testing their theory on a set of observations for a different technology. Though this study uses a smaller data set, it provides statistical support of Burke, Fournier, and Prasad's finding in cardiac surgery with data from another state and for a different technology.

There are several limitations to this study. This study does not control for time-varying hospital effects; however, it controls for local market and hospital fixed effects. This study does not consider measures of cost, quality, morbidity or mortality.²⁷ Evidence from the personal interviews suggested that there are a minimum number of surgeries per physician to achieve best outcomes. Several cited the 100 surgery level,²⁸ which is the minimum per year required by the American College of Surgeons (ACS) and the American Society for Metabolic & Bariatric Surgery (ASMBS) to achieve Center of Excellence (COE) designation. Both those agencies track in-hospital morbidity, mortality and 30-day readmission rates.

This study suggests areas for policy intervention. Lack of star physicians may mean welfare losses occur. Efforts to draw star physicians to hospitals without stars could improve welfare in two ways: (1) the star physicians can diffuse gastric bypass surgery, and (2) nonstars may learn from or may be inspired by co-located stars and increase diffusion rates. This could be welfare enhancing because it could improve access to bariatric surgery, and in particular, to an apparently superior technology.

This study finds that diffusion of a medical technology is more likely when certain hospital and market features are present: a large, urban hospital with a star physician is more likely to diffuse technology than a smaller,

rural hospital or a hospital with no star physicians. It may be that economies of scale are present that make it more efficient for larger hospitals to offer laparoscopic gastric bypass surgery; however, there may be questions of access and equity. Like previously mentioned research, this study also raises the issue that laggards in technology diffusion impose welfare costs on society. Twenty-seven percent of hospitals in this study are either categorized as stars or have diffused gastric bypass surgery by the end of the sample period. All else being equal, is it efficient or equitable for only some Pennsylvania hospitals to have diffused laparoscopic gastric bypass surgery by the end of the sample period? Should all hospitals have laparoscopic gastric bypass surgery? If so, this suggests an area for policy intervention. Efforts to draw star physicians to small, rural hospitals could improve welfare in two ways: (1) the star physicians can diffuse gastric bypass surgery and (2) non-stars may learn from or may be inspired by co-located stars and increase diffusion rates in rural areas. This could be welfare enhancing because it could improve access to bariatric surgery; however, if economies of scale are present and rural markets are very small, efficiency losses must be carefully weighed against equity gains. Alternately, it may be helpful to send physicians from rural hospitals to learn from star physicians at larger, urban hospitals.

This study suggests some areas for further investigation. Burke, Fournier, and Prasad²⁹ studied a treatment that is generally for an acute condition. This study considered a treatment for a chronic condition, obesity. Perhaps concentration of surgeries in relatively few hospitals may improve skill levels, reduce mortality, and be an overall superior allocation of society's scarce resources.

It may be that the tradeoff between quality and distance traveled is preferred by patients and providers for this technology. Further studies, especially of chronic disease treatments, might help define whether differences in observations have to do with patient preferences or the nature of the disease treated. Because chronic disease affects almost one out every two adults in the US, the tradeoffs between patient quality of care and concentrations of technology for particular treatments become interesting areas for further study. Further studies of technology for acute disease treatments might reveal a different set of preference tradeoffs and might indicate that concentrations of the technology in relatively few centers is socially wasteful because it limits access to vulnerable populations.³⁰

Appendix 1: Description of the Data

Proprietary data from the Pennsylvania Health Care Cost Containment Council (PHC4) include 39,918 patient level observations from each nonfederal, short-term, acute-care hospital in the state of Pennsylvania from fourth quarter 1995 through second quarter 2007. Patient information includes patient diagnoses, hospital length of stay, age, race, gender, county, and ZIP code of residence. Diagnoses include up to eight Diagnostically Related Group (DRG) procedure codes. Procedure data for each surgery are classified according to the *International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM)*³⁵ procedure codes: 44.31, the code for open gastric bypass surgery, and 44.38, the code for laparoscopic gastric bypass.

For years 1995–2007, the PHC4's public report, *Financial Analysis, Volume 1, General Acute Care Hospitals*,³⁶ is used. The reports include hospital size (measured in

beds), hospital closures, openings, mergers, and name changes. Each hospital's Council of Teaching Hospital (COTH) status is obtained from the American Association of Medical Colleges' Council of Teaching Hospitals and Health Systems.³⁷

The PHC4 proprietary data include the Pennsylvania medical license number of the operating physician, attending physician, and referring physician for each entry. Each license number is matched with the physician's name and address from the Pennsylvania Department of State database. Residency, special training, medical school graduation date, and school are matched from the publicly available American Medical Association physician database. Data from *America's Top Doctors*[®] publications³⁸ were graciously provided by officers from Castle Connolly Medical Limited. Castle Connolly produce annual publications that rank the top 1 percent of physicians in the US according to specialty. Physician information is also obtained

from individual hospital Web sites and from phone calls and emails to individual physicians.

I conducted a series of informal interviews with a small sample of physicians and administrators. This group represented 12 of 24 hospitals in the Philadelphia metropolitan market. The interviews provide a limited qualitative analysis of the decision-making process of hospitals and physicians in adoption and diffusion of bariatric surgery. The key finding regards the decision-making process. Two discernible patterns emerge. In some cases, diffusion is initiated by a physician. In other cases, diffusion is led by hospital administration. The findings may not be applicable to all hospitals, but they suggest certain explanations for observed diffusion patterns.

The interviews were approved by Temple University IRB #13184, dated August 23, 2010. The introductory letter and questionnaire follows. The questionnaire was used as a starting point for discussion.³⁹

Introduction Letter



Dear Sir/Madam,

A research team at Temple University is conducting a study on how star physicians impact the diffusion of medical technology. We are requesting hospital administrators, board members and physicians to comment on the following survey questions in an interview. This survey has a total of 12 questions.

Your participation in this study is voluntary. You may choose not to participate and/or to withdraw from the study at any time. This survey is anonymous.

The overall results of the study may be published, but the research will be conducted with an assurance of confidentiality for you and your organization. Neither your name nor your individual answers will be known.

Participation in this interview will be considered your consent to participate.

If you have any questions concerning this interview, please contact Laura Shinn at (xxx) xxx-xxx, or by email, shinn@temple.edu.

Primary Investigator's Signature

Date

Questionnaire

| | Agree Strongly | | Neutral | | Disagree Strongly |
|---|-------------------|---|---------|---|----------------------|
| 1. A single physician or group of physicians originates bariatric surgery at this hospital. | 1 | 2 | 3 | 4 | 5 |
| 2. Administration or the board of directors originates bariatric surgery at this hospital. | 1 | 2 | 3 | 4 | 5 |
| 3. One physician in the hospital is recognized by the other doctors as a Top Doc, or Star, or opinion leader in bariatric surgery. | 1 | 2 | 3 | 4 | 5 |
| 4. A star brings status to other surgeons in the hospital. | 1 | 2 | 3 | 4 | 5 |
| 5. Stars may generate a spill over effect to increase demand for the entire spectrum of services offered by the hospital. | 1 | 2 | 3 | 4 | 5 |
| 6. Bariatric surgery is profitable for the hospital. | 1 | 2 | 3 | 4 | 5 |
| 7. Bariatric surgery is highly profitable for the physician, that is, compared with other abdominal surgeries. | 1 | 2 | 3 | 4 | 5 |
| 8. Laparoscopic surgery is a substitute for open surgery. | 1 | 2 | 3 | 4 | 5 |
| 9. Patients prefer laparoscopic surgery over open surgery. | 1 | 2 | 3 | 4 | 5 |
| 10. Laparoscopic restrictive devices are substitutes for gastric bypass surgery. | 1 | 2 | 3 | 4 | 5 |
| <p>Other questions: Which hospitals do you see as your main competitors in the market for bariatric surgery? Is my assumption of at least two surgeries per month for four consecutive quarters, that is, 24 surgeries per year, indicative of a hospital having diffused bariatric surgery. What do you estimate as a minimum number of bariatric surgeries a hospital would need to do to achieve efficiency?</p> | | | | | |

REFERENCES

1. Rogers, E, *Diffusion of Innovations* (5th ed.), The Free Press, New York, 2003; Coleman, J, Katz, E, and Menzel, H, "The Diffusion of an Innovation Among Physicians," *Sociometry*, December 20:253–270 (1957).
2. Huckman, RS, "The Utilization Of Competing Technologies Within The Firm: Evidence From Cardiac Procedures," *Management Science*, 49(5):599–617 (2003).
3. Berwick, DM, "Disseminating Innovations In Health Care," *Journal of the American Medical Association*, 289:1959–75 (2003).
4. Burke, M, Fournier, G, and Prasad, K, "The Diffusion Of A Medical Innovation: Is Success In The Stars?" *Southern Economic Journal*, 73(3):588–603 (2007); Burke, M, Fournier, G, and Prasad, K, "The Diffusion Of A Medical Innovation: Is Success In The Stars? Further Evidence," *Southern Economic Journal*, 75(4): 124–78 (2009).
5. Huesch, MD, Comment On "The Diffusion Of A Medical Innovation: Is Success In The Stars?" *Southern Economic Journal*, 75(4): 1270–1273 (2009).
6. VanDenBulte, C, Lilien, G, "Contagion versus Marketing Effort," *American Journal of Sociology*, 106(5):1409–1435 (2001).
7. Coleman, *supra*, n.1.
8. Burke, *et al.*, (2009) *supra*, n.4
9. Castle Connolly maintains a database with regional and national Top Doctors. Surgeons may be named Top Doctors in national or regional print publications and/or online directories. Connolly, J, Morgan, J, *America's Top Doctors, 12th ed.*, Castle Connolly, Ltd, New York, 2012. *Top Doctors: Arizona 2010*.
10. National Institutes of Health, 1991, *Gastrointestinal surgery for severe obesity*, NIH Consensus Statement Online, 9(1):1–20.
11. Health Grades Inc., *The Second Annual Health Grades Bariatric Surgery Trends in American Hospitals Study*, Golden, Colorado: Health Grades Inc. (2007); Thomson Reuters, "Healthcare Trend Tracker: Growth In Bariatric Surgery Focuses On Changes In Technique," retrieved from <http://home.thomsonhealthcare.com/News/view/?id=1241> (2007).
12. Sjöström, L, Narbro, C, Sjöström, CD, Karason, K, Larsson, B, Wedel, H, *et al.*, "Effects Of Bariatric Surgery On Mortality In Swedish Obese Subjects," *New England Journal of Medicine*, 357(8):741–52 (2007).
13. Health Grades Inc., *The Third Annual Health Grades Bariatric Surgery Trends in American Hospitals Study*, Golden, Colorado: Health Grades, Inc. (2008).
14. Jones, K, Afram, B, Benotti, P, Capella, R, *et al.*, "Open versus Laparoscopic Roux-en-Y Gastric Bypass: A Comparative Study of Over 25,000 Open Cases and the Major Laparoscopic Bariatric Reported Series," *Obesity Surgery*, 16: 721–727 (2006).
15. Schauer, P, Ikramuddin, S, Gourash, W, Ramathan, R, Luketich, J, "Outcomes After Laparoscopic Roux-en-Y Gastric Bypass for Morbid Obesity," *Annals of Surgery*, 232: 515–529 (2000).
16. National Center for Health Statistics, "International Classification of Diseases, Ninth Revision, Clinical Modification," retrieved from <http://www.cdc.gov/nchs/icd/icd9cm.htm> (2012).
17. Pennsylvania Health Care Cost Containment Council, *PHC4 Reports County Profiles*, retrieved April 9, 2010, from PHC4: <http://www.phc4.org/countyprofiles/> (2010).
18. AAMC, Council of Teaching Hospitals and Health Systems (COTH), Washington, DC: American Association of Medical Colleges, retrieved from <https://www.aamc.org/members/coth/> (2011).
19. Gresenz, C, Rogowski, J, and Escarce, J, "Updated Variable-Radius Measures of Hospital Competition," *Health Services Research*, 39(2): 417–430 (2004).
20. Phibbs, CS, and Robinson, J, "A Variable-Radius Measure of Local Hospital Market Structure," *Health Services Research*, 28(3): 313–324 (1993).
21. Phibbs, *supra*, n.20.
22. Gresenz, *supra*, n.19.
23. Castle, *supra*, n.9.
24. Castle, *supra*, n.9.
25. Burke, *supra*, n.4.

26. Burke, *supra*, n.4.
27. See Picot, J, Jones, J, Colquitt, JL, Gospodarevskaya, E, et al., "The Clinical Effectiveness And Cost-Effectiveness Of Bariatric (Weight Loss) Surgery For Obesity: A Systematic Review And Economic Evaluation," *Health Technology Assessment*, 13(41):1–190 (2009).
28. Berwick, DM, "Disseminating Innovations In Health Care." *Journal of the American Medical Association*, 289 (April 16), 1959–75 (2003); Picot, J, *supra*, n.27.
29. Burke, *supra*, n.4.
30. Martin, M, Beekley, A, Kjorstad, R, and Sebesta, J, "Socioeconomic disparities in eligibility and access to bariatric surgery: a national population-based analysis," *Surgery for Obesity and Related Diseases*, 6(1): 8–15 (2010); Wallace, AE, Young-Xu, Y, Hartley, D, and Weeks, WB, "Racial, Socioeconomic, and Rural-Urban Disparities in Obesity-Related Bariatric Surgery," *Obesity Surgery*, 20(10):1354–60 (2010).
31. Health Grades Inc., *The First Annual Health Grades Bariatric Surgery Trends in American Hospitals Study*, Golden, Colorado: Health Grades Inc. (2006); Health Grades Inc., *supra*, n.11; Health Grades Inc., *supra*, n.13; Health Grades Inc., *The Fourth Annual Health Grades Bariatric Surgery Trends in American Hospitals Study*, Golden, Colorado: Health Grades Inc. (2009); Health Grades Inc., *The Fifth Annual Health Grades Bariatric Surgery Trends in American Hospitals Study*, Golden, Colorado: Health Grades Inc. (2010).
32. Phibbs, *supra*, n.20.
33. Gresenz, *supra*, n.19.
34. Shinn, L, Ph.D. dissertation, *The Impact of Star Physicians on Diffusion of a Medical Technology: the Case of Laparoscopic Gastric Bypass Surgery*, Temple University, United States–Pennsylvania (2011).
35. National Center for Health Statistics, *supra*, n.16.
36. Pennsylvania Health Care Cost Containment Council, *supra*, n.17.
37. AAMC, *supra*, n.18.
38. Castle, *supra*, n.9.
39. Shinn, L, *supra*, n.34.

Health Policies and Intervention Strategies

A Description of Current Issues and Approaches to Care of the Public Health and Health Care System in the United Arab Emirates

Aliye T. Mosaad and Mustafa Z. Younis

The demographic factors of the United Arab Emirates (UAE) have changed drastically within one generation. This is evident in how quickly it has moved from a developing nation, where fishing was once the main source of income, to a country that is quite developed, competing on a global level. From one perspective, socio-economic progress has brought many benefits to the population. These include improved education, better access to health care, and safe drinking water. However, on the other hand, economic development has been the cause for changes in lifestyles, eating habits, and traditional societal and family structures.¹ Over time, these changes have added up, creating an unprecedented impact on the population's health. This impact has crept up onto the society until suddenly a notable epidemic has become recognized in the country. According to the UAE Ministry of Health, 19.5 percent of the UAE population has diabetes, making it the second highest rate in the world.² The structure and responsibilities of the current UAE health care systems along with other cultural factors were investigated in order to determine their impact on the growing epidemic.

Key words: *United Arab Emirates, demographics, diabetes, health systems, cultural barriers, health awareness, food marketing, health initiatives*

Introduction

Demographical Information

The United Arab Emirates (UAE), founded in 1971, is a country located in the Middle East, bordering the Gulf of Oman and the Persian (Arabian) Gulf, between Oman and Saudi Arabia. It consists of seven emirates or "states" that have united to form the UAE. These emirates include: Abu Dhabi, Dubai, Sharjah, Ajman, Umm Al Quwain, Fujairah, and Ras Al-Khaimah. The two richest and most widely known emirates are Abu Dhabi (the capital of the country) and Dubai. The United Arab Emirates put itself on the map by discovering oil more than 30 years ago, opening the door for the development of an open economy and allowing the country to compete on an international scale. The country is now a central hub in the eastern hemisphere for business development, engineering feats, and a place where technological advances are first being introduced. The UAE is the most liberal of

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the Gulf States, and the most modern Middle Eastern country.³ These factors have also given the country an economic boost allowing it to play an important role in the region.

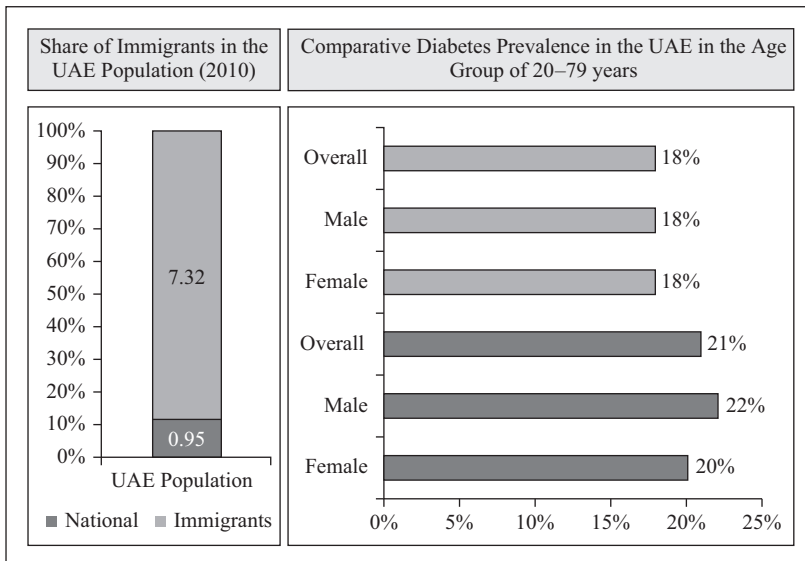
The UAE has the characteristics of a developing country, including: high fertility rates, low literacy among the traditional population, strong traditional cultural values, and many people living in multigenerational homes. It also has the characteristics of a developed country in terms of a high economic status, with most families having servants, an urbanized population, and a high growth rate of the elderly (those 65 years of age and older). As the young currently dominate the population percentage-wise, implications are that in the near future

the majority of the population will consist of the elderly. This shift—better known as demographic aging—will bring about higher levels of chronic diseases such as diabetes, if something is not done (*see* Figure 1).⁴

The country is one of a desert climate with extremely hot and humid summers. Regarding religious practices, 96 percent of the population follows the practice of Islam while the other 4 percent are Christian or. What makes the UAE unique is that less than 19 percent of the total population of the country is actually originally “Emirati,” also known as the UAE nationals (*see* Figure 1). Most of the country is composed of expatriates (*see* Table 1). Because the actual citizens of the country are quite low in number, the gov-

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Figure 1. UAE National versus. Immigrants (Expatriates) Population and Diabetes Prevalence



Source: Middle East Health Magazine Jan 2013. Data collected from Booz Allen Hamilton analysis of data from Boston Analytics; International Monetary Fund World Outlook Database; International Diabetes Federation. Diabetes Atlas, 5th Ed. 2009; World Bank Atlas 2012; World Bank Databank 2009.⁵

Table 1. Statistical comparison of the Emirati Population to the Expatriate Population.

| Population by Nationality (National and Nonnational) and Sex (2010 mid-year estimates) | | | |
|---|------------------|------------------|------------------|
| Nationality | Male | Female | Total |
| National | 479,109 | 468,888 | 947,997 |
| Nonnational | 5,682,711 | 1,633,362 | 7,316,073 |
| Total | 6,161,820 | 2,102,250 | 8,264,070 |

Source: United Arab Emirates National Bureau of Statistics.

ernment is trying to increase their citizens' population by providing incentives for citizens to marry one another, such as monetary gifts upon marriage.⁶

The Gulf Cooperation Council

The Gulf Cooperation Council (GCC) countries consist of Bahrain, Kuwait, Qatar, Oman, Saudi Arabia, and the United Arab Emirates. These countries are composed of populations that are of similar cultural backgrounds, religion, language, lifestyles, and income; thus they are comparable and all face analogous health issues. Many countries in the Gulf region of the Middle East are ranked in the top 10 countries with the highest prevalence of diabetes (see Figure 1).

Modernization's Impact on Society and its Health

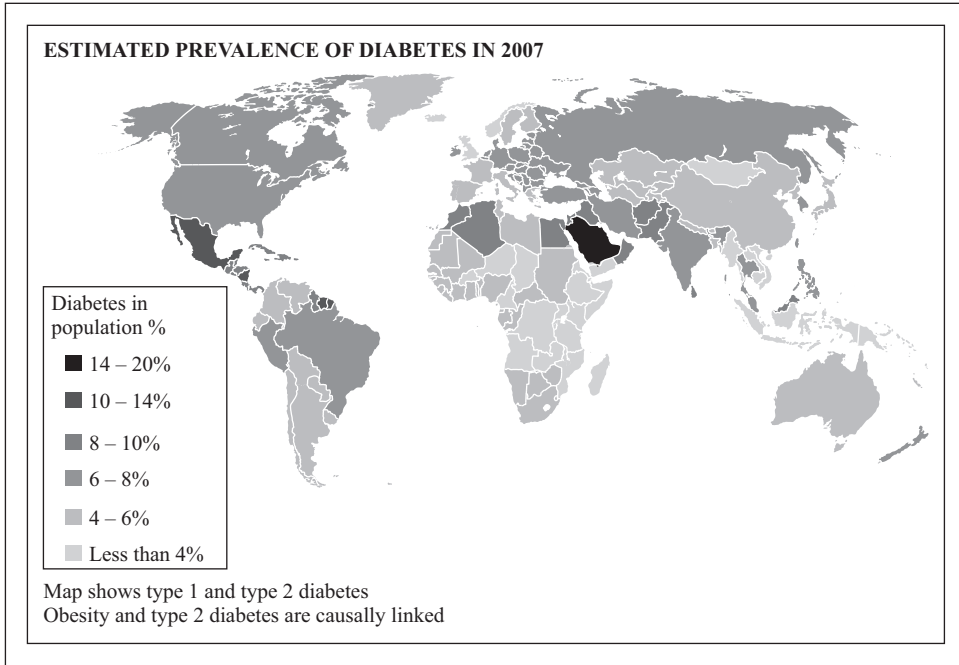
An explosive epidemic of diabetes has begun to plague the developing countries of the world that are undergoing modernization. Modernization in society can be defined as the process of economic and socio-cultural change, by which traditional cultures industrialize and develop a capitalist economy, characterized by division of labor, reduced importance of kinship, and changes in tra-

ditional lifestyles.⁹ Previous research has been done on some countries and indigenous populations with the highest rates of diabetes in the world. This epidemic has had an exponential growth rate within recent years.

A recent study done in the United Arab Emirates indicates that high rates of industrialization and modernization are correlated with a decrease in fertility rates and infectious disease. On the flip side, an increase in chronic disease and an increase in life expectancy are also seen.¹⁰ This trend is part of the epidemiologic transition and has started to impact the health status and policy decisions of the UAE.

The GCC countries have undergone a substantial amount of modernization within recent decades. The UAE infant mortality rate is ranked 138th in the world with 12.7 deaths per 1,000 live births, and the average life expectancy of individuals is 76.11 years.¹¹ Health care spending in the region is expected to increase from \$12 billion today, to approximately \$60 billion by the year 2025. Diseases of affluence and their risk factors are to blame for such a spike in health care spending. Governments and their health institutions are not currently equipped or prepared for the main risk factors needing their attention, which include: population growth, an aging population, and

Figure 1. Estimated Prevalence of Diabetes Worldwide in 2007



Source: The Diabetes Atlas 2006.⁸

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health risk factors. A change in the health policy and regulations of the UAE Ministries of Health is essential in order to cope with the growth of chronic ailments such as diabetes, and to care for its growing and aging population.

Aging Population

One study involved participants chosen from the UAE community to answer survey questions based on their health status and diabetes. It was noted that in comparing the US and UAE, both countries had similar rates of functional independence, but the US had higher rates of chronic problems in the elderly, with diabetes as the exception. A point of discussion in these results was that the UAE has a higher regard for tradi-

tional values, close family ties, the universal practice of religion, and high economic resources, all of which are attributed to the elderly maintaining a higher level of health into their later years.¹² It is rare for the elderly to be seen living in institutionalized care facilities unless they are severely disabled. It was also found that the annual UAE growth rate for those over the age of 65 is around 10.3 percent, which is the highest predicted in the world between the years of 1999 and 2025. This indicates the urgent need for planning the care of the elderly and the huge number of individuals with chronic illnesses, such as diabetes, that will need treatment in the near future.¹³

Life expectancy in the GCC rose from 60.5 years in 1978 to 73 years in 2004. The

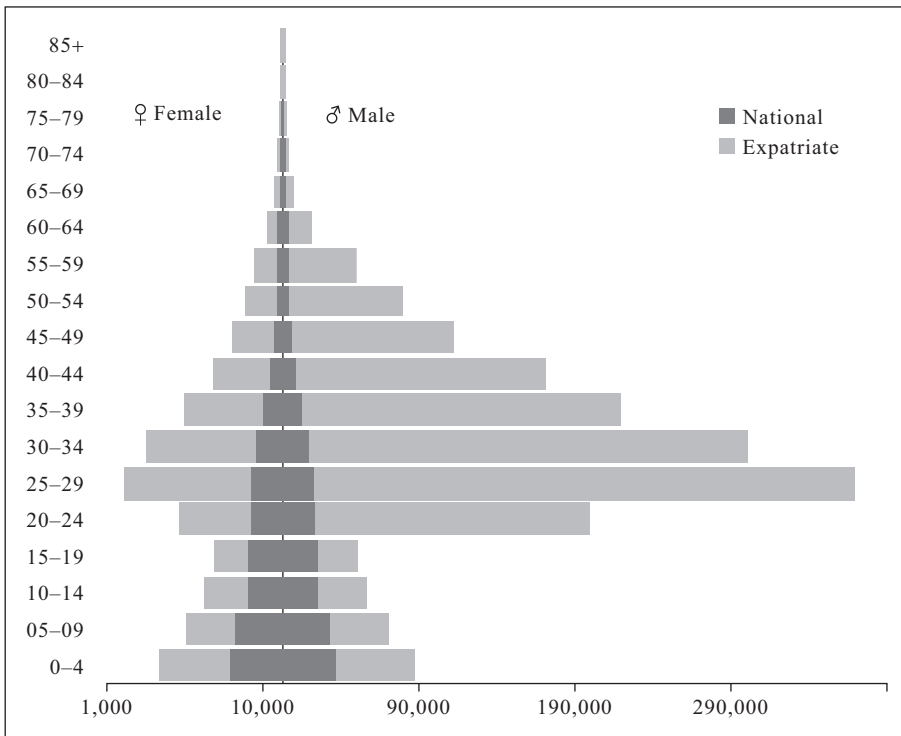
population above the age of 60 years in the GCC is expected to increase to 15 million by 2050.¹⁴ Dubai’s population demographic currently has 88 percent of its population below the age of 45 (*see* Figure 2). The Dubai Health Authority expects that as its population ages, the rates of diabetics will double from 350,000 in 2000 to 700,000 in 2030. This is a major concern as more life-style diseases mean higher per capita health care costs are to be expected.

Obesity and Diabetes

More than 70 percent of the UAE population is overweight.¹⁶ According to a

study done on childhood obesity and diabetes in the Emirates, important factors noted include: the relatively high percentage of consanguine relationships, the elevated genetic risk for diabetes compared with many other populations of the world, and the widespread use of traditional clothing. What is unique about the clothing in the Gulf region is that men and women wear loose-fitting robe-type outfits known in Arabic as the white “dish dash” for men, and the black “abaya” for women. Unlike what men and women wear in westernized countries, such as jeans and fitted shirts where one notices their weight and

Figure 2. Distribution of Various Age Groups in the UAE population in 2011.



Source: Statistics Center of Abu Dhabi population estimates for Nationals, additional Health Authority of Abu Dhabi assumptions and analysis based on raw insurance data, Health Statistics 2011 from the Health Authority of Abu Dhabi.¹⁵

waistline, the loose clothing conceals the body shapes of individuals in the UAE. The climate also plays into the obesity problem. With such hot climates most people sit indoors or go from place to place by car. It is not common to see an Emirati walking or exercising outdoors. One might be considered from a lower socioeconomic status if she or he did not go from place to place by car. Lastly, another obstacle in the fight against obesity, which is similar to that of many other Mediterranean and African countries, involves the idea that being overweight shows good health, wealth, and success.¹⁷

Marriage Trends

Intra-familial marriage is common in the UAE and has been thought to be related to the genetic predisposition for diabetes. Because the Emirati population is so low in comparison to the expatriates of the country, the government is pushing for marriage between Emiratis. This is being done with the government setting up incentives, such as a marriage fund, for Emiratis who marry other Emiratis. Intra-familial marriage is a common practice that has taken place over hundreds of years in Bedouin tribes and continues to be common today. There have been some studies done to test for possible links to diabetes. One study was conducted in Saudi Arabia, where intermarriage, especially between first cousins, a common form of marriage, was analyzed to see whether there was a correlation between consanguinity and diabetes prevalence. The study involved standardized questionnaires that were administered detailing general demographics, dietary patterns, anthropometric values, family history, consanguinity, and

familial aggregation of diabetes. An odds ratio of 6:2 for familial aggregation suggests a causal association with diabetes. More studies need to be done to confirm the accuracy of such findings.¹⁸

The Health System of the United Arab Emirates

The World Health Organization (WHO) defines health systems as “all organizations, institutions, and resources that are devoted to producing health actions.¹⁹ Health system strengthening (HSS) involves strategizing in order to improve the functions of the system with the goal of improving health through improved access, quality, coverage, or efficiency in health care.²⁰ “The *World Health Report 2000* identifies four key functions of the health system, which include: stewardship (often referred to as *governance* or *oversight*), financing, human and physical resources, and organization and management of service delivery.”²¹ Stewardship in health is composed of factors that are not directly related to the health care system, yet have an impact on the health of a population, some of which include: the environment, levels of education, and poverty. The World Health Organization has recommended the development of health sector policy, as the primary role of a government’s Ministry of Health, with the aim of improving the performance of the health system and the health of the population.²²

The health care laws of the UAE are regulated at the Federal level and the Emirate level. Federal regulation dates back to the 1970s and 1980s.²³ Public health care services are controlled and regulated by four main authorities: The Ministry of Health, the Health Authority of Abu Dhabi (HAAD), the

Dubai Health Authority (DHA), and Emirates Health Authority (EHA).

The main UAE Ministry of Health, established in 1972, is in charge of licensing companies and individuals who provide health care, manage health institutions, and regulate various aspects of the field. The Dubai Health Authority is authorized to regulate all the health facilities in Dubai.²⁴ In 2009 the Dubai Health Authority implemented a new Policy and Strategy Sector. Its mission is to oversee the development of policies and strategic planning undertaken by the Dubai Strategic Plan. This department works on intense policy analysis, strategy execution, and partnership with consumers, providers, regulators, and funders of health and health care in Dubai and the UAE.²⁵

The Health Authority of Abu Dhabi (HAAD) is the entity responsible for regulating the health sector within Abu Dhabi. It works by setting up evidence-based protocols, and developing structured programs aimed at patient and physician compliance, and geared towards measurable results.²⁶ Abu Dhabi established a unique division called the Abu Dhabi Health Services Company (SEHA) in 2007. The Abu Dhabi government owns this public joint stock company and it manages and owns the public health facilities. This entity is currently collaborating with renowned health care institutions such as Johns Hopkins Medical and The Cleveland Clinic for the management of certain hospitals. Lastly, the northern Emirates, Ras Al Khaimah, Ajman, Umm Al Quwain, Sharjah, and Fujairah, as of 2009 are under the control of the Emirates Health Authority, which has similar regulations as the HAAD and the DHA.²⁷

Financing Health Care between the Public and Private Sector

Currently the region uses and consumes about 25 percent of health care spending in private care centers. In recent years, it has become common for many patients to go to public government hospitals for actual health care treatments, and only use private care facilities for diagnoses. With public government hospital occupancy rates averaging 80 percent, private hospital occupancy is significantly lower. The reason for this pattern is that insurance companies do not cover care undertaken at private facilities.²⁸

A study done by McKinsey and Company analyzing the health ailments of the GCC countries indicates various aspects of the current health policy situation.²⁹ The company created a propriety model of health care demand by focusing on five change factors, which include: population growth, the demographic profile, the development of risk factors, treatment patterns, and medical inflation.³⁰ Treatment demand is expected to increase in the region by 240 percent by the year 2025. Hospital bed demand is predicted to more than double in the UAE and Saudi Arabia. Currently the highest utilization of health care in the GCC is by publicly run, government health care facilities. Research found that many individuals are not satisfied by the quality of care in public facilities, and complain about long wait times, uncomfortable facilities, and limited availability of appointments.³¹

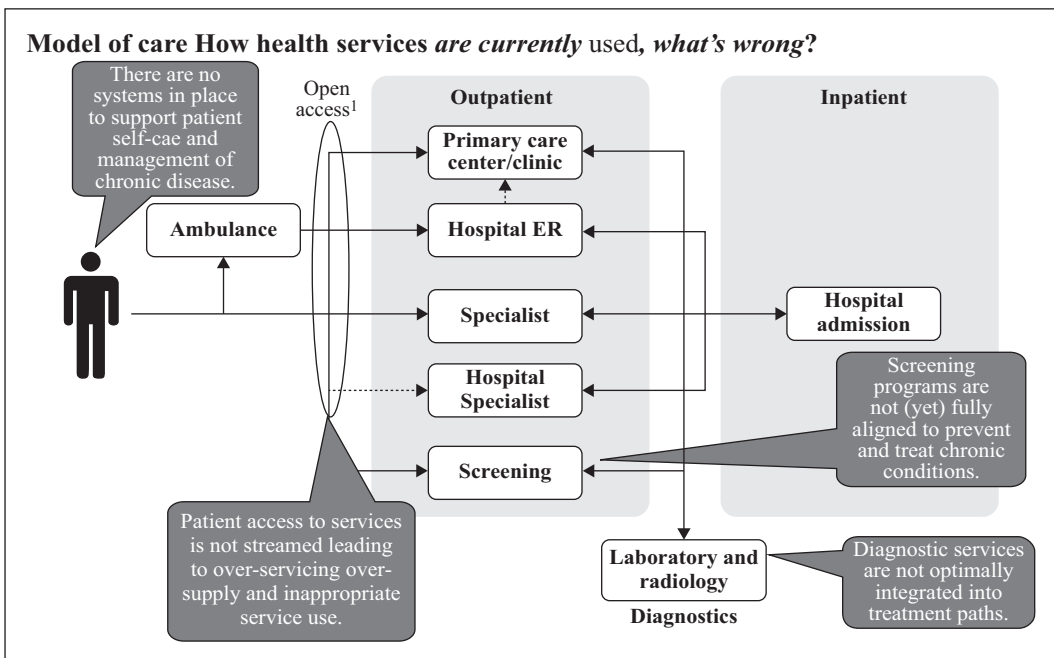
The privatization of health care delivery is focused on three areas: health care delivery, health insurance, and support services. Government entities in the GCC region, such as the UAE Health Ministries, now

want to lessen their involvement in health care delivery, and focus such efforts on private health facilities, as well as have private entities manage public facilities. With the construction sector boom in the UAE and neighboring GCC countries, many expatriate workers flocked to the region for work. Expatriates now comprise 25 percent of the GCC population and 80 percent of the UAE population (4.8 million out of 6 million).³² The first two ministries of health to pass laws requiring employers to purchase private insurance for their workforce of expatriates are Saudi Arabia and Abu Dhabi (UAE). The goal of policymakers is aimed at creating a mixed public-private payer method to get patients to have a choice between using pub-

lic and private providers, which would both be covered by insurance. Qatar and Oman are in the planning process of implementing mandatory health insurance for all of their citizens.³³

Enforcing such a policy change would completely revamp the health care system of the country. It is also their hope that the private sector would assist in improving the quality of other areas, such as implementing an electronic medical record system. There are many issues that must be taken into consideration while trying to privatize the health care industry. A patient threshold volume needs to be maintained in order to establish a private model of care based on general practice. A referral network is lacking, and

Figure 3. Current Model of Problems with the Health Care System in Abu Dhabi



Source: Strategy Analysis, Health Statistics 2011, Health Authority of Abu Dhabi.³⁴

Note: Access to SEHA hospital specialists is only via referral from SEHA Centers/Clinics and ER departments. Some SEHA Hospital ER departments also direct nonemergency patients to adjacent "Urgent care" centers.

needs to be established, as it is an important portion of a health care system. Lastly, clinical staff and support needs to increase in the region.

Health Care Awareness and Quality

In the UAE and the rest of the GCC region there is a lack of effective regulation by the government, and most patients do not understand what good quality in health care entails. Patients tend to make their health care decisions based on word of mouth, the external physical appearance of the facility, and advertising. Better local treatment needs to be made available as so much money from the government is spent on sending citizens abroad for treatment. In 2007, the Dubai government sent approximately 1,000 patients abroad for medical treatment costing \$48 million. An estimate of \$2 billion is spent annually in sending citizens abroad for medical treatment.³⁵ For those who understand health care quality, they do not trust the quality of care of either the facilities or the physicians in the region, and decide to go abroad for treatment. Many times there are also cases in which specialists in treating certain conditions cannot even be found in the country, leaving individuals no other option than to go abroad.

According to the Dubai Health Authority, awareness is also lacking regarding the importance of primary health care and prevention. Primary care service utilization by UAE nationals is at or below benchmark levels. Given the high levels of diseases such as diabetes, primary care utilization, such as screenings and yearly physical exams, should be much higher.³⁶ A strategic move came in April 2008 when Abu Dhabi decided to implement a program called *The Weqaya Program* (Arabic for prevention).

This initiative came as part of the Abu Dhabi Cardiovascular Disease program, aimed at the number one disease killer in the country. Individuals ranging in age from 18 to 75 years seeking the UAE government's new, free, comprehensive health insurance plan, made available to all UAE nationals residing in Abu Dhabi, are now required to undergo screening for cardiovascular risk factors. As a result, UAE nationals receive *Thiqa* health insurance cards giving them access to private and public sector health care.³⁷ This screening program was developed in accordance with recent recommendations from the Institute of Medicine, WHO, the United Nations, and the World Economic Forum for addressing this chronic disease at the population level. Results of this screening program found many cardiovascular risk factors overlapping with diabetic patients. Among the patients, 54 percent were obese and 82 percent were centrally obese (excessive abdominal fat), 73 percent had dyslipidemia, and 59 percent were hypertensive. It was found that by the ages of 18 to 20 years old, 49 percent of men and 34 percent of women were already overweight or obese.³⁸ As part of the *Thiqa* insurance renewal, female adults between the ages of 40 and 69 are required to be screened for breast cancer.³⁹ Whole population screening programs are a step in creating a prevention type mindset in the population. The *Weqaya* program targeted interventions in well-stratified groups using new technology.

To work on quality issues, the HAAD is starting the "Pay for Quality" initiative "where health facilities will receive incentive payments for compliance with HAAD standards of care." In addition, another portion of the initiative will tackle the volume incentive needed by physicians of maintaining a certain

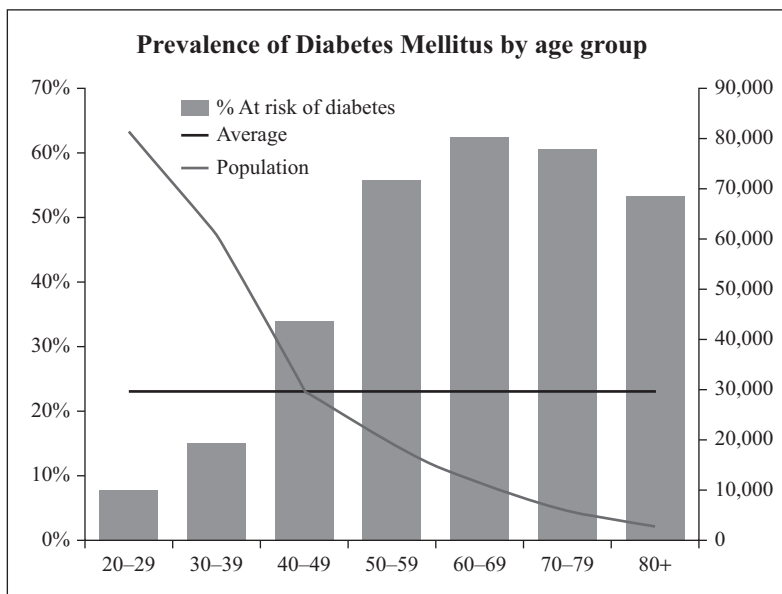
number of patients in the facilities. HAAD has begun creating databases for vital statistics and health data with the hope of integrating business models for such databases, releasing its first collection of data at the end of 2011 (see Figure 4). The goal of both initiatives is to complement the work of such providers as a step in creating a higher quality system of health care for the other emirates to follow in the country.⁴⁰ In 2009, the Ministry of Health also began an initiative to complete the first Emirati diabetic database. The objective in creating the database is to provide the Emiratis of the country with the required information about diabetes, including methods of prevention and treatment. The Minister of Health, Humaid Mohammad Obaid Al-Qutami, launched the Web site as the first UAE National Registry of Diabetics.

The aim is to lower the prevalence rates in the country by 1 to 2 percent per year.⁴¹

Cultural Attitudes and Barriers towards Health

In the nearby country of Qatar, ranked as the richest nation in the world, one of the few traditions that Qatari nationals have been able to maintain is intermarriage between family members. Combining a lifestyle of wealth and interfamilial marriage, citizens are becoming more obese and passing on many genetic disorders. This country ranks as the sixth highest in the world concerning diabetes prevalence. There are now many public awareness campaigns intended to educate the public about healthy eating, exercise, fitness, and sport habits.⁴³ The problem is that although most people have now heard of

Figure 4. Abu Dhabi Diabetes Prevalence 2011 released by HAAD



Source: Preliminary analysis of Weqaya sample of 112,301 UAE Nationals in the Emirate screened in 2008-9, Health Statistics 2011 from Health Authority of Abu Dhabi.⁴²

diabetes and its health implications no one is really taking steps to avoid the disease until it is too late. This passive attitude is a common problem in the culture of the countries of the GCC. Although the Ministry of Health may have policies and programs aimed at methods of prevention, the mindset and lifestyles of the people are not yet cooperative enough to care. The government is trying to construct parks, sidewalks, pedestrian crossings, residential neighborhoods, outdoor exercise equipment, and automated bicycle rental kiosks. These are all great projects to get the public physically active; however, the climate of Qatar along with UAE and the other GCC countries, has people spending at least four to five months of the year mainly indoors as they are unable to tolerate the summer heat, which can reach approximately 50°C (~120°F). In addition, traditional women of any GCC country will not be seen exercising outdoors, or in front of men, as it is not culturally acceptable.

In order to tackle the many chronic conditions plaguing the countries, educating the public as a preventive strategy is essential. Preventative care is still at a primitive level in the Middle East. The current health policy model of care by the government of Abu Dhabi does not focus on prevention of health ailments. More awareness needs to be implemented in order for patients to feel empowered, more educated, and actively seek out screening.⁴⁴ Many Arabs are passive and they wait until something happens before they go to the doctor. This fatalistic behavior is rooted in the Arab/Islamic culture's surrender to "God's will." This attitude offsets the recognition of necessary preventative measures. Many patients, especially those of Bedouin origins, that hold tightly onto traditions and are not educated

on health awareness, do not believe in modern medicine.

A physician interviewed in Dubai for this review noted that many families tie stigma to having a disease, so they go into denial and do not address the problem. "Some patients will be offended if you even point out that they have a problem." Another critical issue is that "people of the UAE do not grasp the concept of caring for themselves; they need someone to do everything for them. Even if I teach someone how to inject him/herself with insulin, most still refuse to do it themselves." A big problem in the region is also the food that people are consuming. Not only are the western foods that have entered the region bad for your health, but also many Arab foods are quite fattening. "The culture of the society now has people sitting around for hours socializing over food into very late hours of the night, which is bad for one's health."⁴⁵

There are now many health care workshops for doctors including primary care physicians. Currently expatriates comprise 82 percent of physicians in the GCC region. An issue the region has faced with expatriate physicians is that they have shown a high turnover rate. Also with many expatriate physicians having to collaborate their work, there is a collection of different cultures having to work together from different training backgrounds and work ethics, which can sometimes make things difficult. Cultural understanding is essential between the physician and the patient. When this is not present, the physician will have a hard time in dealing with the mindset of the patient. This poses the need for more GCC national physicians and nurses in the health care industry, with quality training and standards of performance.⁴⁶

AU: What do u mean by "collaborate" here? Please clarify.

Food Marketing Techniques

An interview conducted with a marketing executive at a regional canned foods company located in Dubai indicated that the branding image of Middle Eastern women is the primary target of all marketers in the region's food industry. "Our target audience, women of the Middle East, either newly married or those from the age of 30 to 40 gain a form of self-validation from feeding their loved ones. They perceive themselves as good mothers when they are able to prepare a good meal for their families. In their definition, a good meal is a delicious meal that is well-presented." It was further explained that if their message is not communicated in this way, many women would find they are unable to relate to the brand. Further, during the interview, the marketing executive contrasted Middle Eastern branding and US branding by stating, "In the United States, food branding is more focused on health-consciousness. However, in the Middle East, many target consumers have still not caught onto the importance of healthy products. Even in the supermarket aisle, you can easily see there are very few healthy products, which make them a niche part of the market".⁴⁷

In order to tackle the diabetes epidemic, the government needs to start by tackling one of the sources of the problem, the food and restaurant industry. According to Al Haddad of *The National* newspaper of Abu Dhabi, many customers in Dubai and Abu Dhabi have begun to voice that they would like to have nutritional information on their menus.⁴⁸ In the United States, a federal law is being implemented that requires all big restaurant chains to put calorie information on menus and drive-through signs. This

regulation has been implemented in New York, California, and Oregon. In the United Arab Emirates, the fast-food industry has been growing at a 25 percent annual rate.⁴⁹ Restaurants lack healthy food options, as it is not considered part of the culture. The government needs to take initiative in this regard, mandating calorie counts and health food options as a preventative measure, and to help those already plagued with a chronic disease. Understanding food labeling and nutritional content is an important part of understanding what is good and healthy for one's body. Many people in the region do not understand how to read food labels. The government should require that such information be taught in school health classes.

Health Initiatives

Initiatives have begun in schools aimed at educating students on the importance of a good diet, after an alarming 70 percent obesity rate has been noted in the country. In the emirate of Ras Al-Khaimah, a six-month awareness campaign has been started in the local schools. The goal of the program is to get teachers to motivate the children to stay away from junk food through various school events.⁵⁰

Educational awareness campaigns are also beginning to appear on public displays. The Walk for Life campaign hosted annually for the past five years showed the greatest turn up of 16,000 individuals on November 25, 2011, at the Yas Marina Circuit, as part of the "award-winning public health awareness campaign 'Diabetes-Knowledge-Action'".⁵¹ This event was held under the patronage of Her Highness Sheikha Fatima Bint Mubarak, organized by the Imperial College of London, sponsored by the Abu Dhabi government

AU: please confirm location of close quote.

holding company Mubadala, and supported by The National Health Insurance Company, Daman. The goal of the event was to bring more public awareness to diabetes and to push individuals to take charge of their lifestyle by embracing a healthy diet along with regular physical activity. Since the start of the campaign, it has reached out to more than 125,000 individuals in the UAE.⁵² According to the National Newspaper of Abu Dhabi, a similar campaign in 2013 called the “Kobe Health and Fitness Weekend” involves the UAE government hosting the celebrity basketball player Kobe Bryant with the goal of raising more diabetes awareness.⁵³

Conclusion

The path to health care reform is more achievable in the UAE compared to lower income countries in Middle East such as Yemen, which lacks access to the health

resources needed due to its mountainous terrain.⁵⁴ The United Arab Emirates has undertaken steps in reforming its health care services sector. A growing and aging population with many chronic ailments will strain the health sector if things are not done to revamp the system, including changing current policies. Progress is currently underway in the country with the government taking initiative in improving quality, awareness initiatives, screening programs, and a new emphasis on the private sector getting more involved by increasing health care facility options. Although education and awareness are now increasing concerning diabetes, the challenge remains of changing people’s attitudes and behaviors towards other health problems. Educating the youth as a preventative strategy, and emphasizing the importance of primary care must increase in the UAE and throughout the region.

REFERENCES

1. Abduelkarem, A, “Childhood obesity and type 2 diabetes: a growing public health challenge in UAE,” *Diabetes Voice*, 50(3):9–11 (2005).
2. Glass, A, “Diabetes costs the UAE millions in 2007” (October 8, 2008). Retrieved October 15, 2011, from Healthcare-Arabian-Business.com, <http://www.arabianbusiness.com/533531-diabetes-costs-the-uae-millions-in-2007>.
3. Edwards, HS, “The Richest, Fattest Nation on Earth (It’s not the United States)” (2011). Retrieved November 20, 2011, from The Atlantic, <http://www.theatlantic.com/life/archive/2011/11/the-richest-fattest-nation-on-earth-its-not-the-united-states/248366/>.
4. Margolis, S, Carter, T, Dunn, E, and Reed, R, “The health status of community based elderly in the United Arab Emirates,” *Archive of Gerontology and Geriatrics*, 37: 1–12 (2002).
5. McLaughlin, G, Kemp, J, and Stoltz, K, *Diabetes in the UAE portrait of a country at risk* (Jan. 22, 2013). Retrieved from <http://www.middleeasthealthmag.com/cgi-bin/index.cgi?http://www.middleeasthealthmag.com/jan2013/feature11.htm>
6. Margolis, S, et al., *supra*, n.4.
7. United Arab Emirates National Bureau of Statistics. Population Estimates 2006–2010.
8. International Diabetes Federation, *Diabetes Atlas 2007*.
9. Ely, J, Zavaskis, T, and Wilson, S, “Diabetes and stress: an anthropological review for study of modernizing populations in the US-Mexico border region,” *Journal of Rural and Remote Health Research, Education, Practice, and Policy*, 1–17 (2011).
10. Margolis, S, et al., *supra*, n.4.
11. *United Arab Emirates*. (n.d.). Retrieved October 22, 2011, from CIA-The World Factbook:

- <https://www.cia.gov/library/publications/the-world-factbook/geos/ae.html>.
12. Ward, W. and Younis, M, *Steps Toward a Planning framework for Elder Care in the Arab World*, Springer, NY, USA (2013); Younis, M, Al-Hajeri, M, Celik, Y, Kisa, A, Richard, P, and Parkash, J, "Healthcare for Aging Population in Kuwait," *Ageing International*, August 2012.
 13. Margolis, S, *et al.*, *supra*, n.4.
 14. *Why invest in Healthcare in Dubai* (June 12, 2010). Retrieved November 2, 2011, from Dubai Health Authority, <http://www.dha.gov.ae/EN/SectorsDirectorates/Directorates/HealthRegulation/HealthCareInvestment/Pages/WhyinvestinHealthcareinDubai.aspx>.
 15. Health Authority of Abu Dhabi, *Health Statistics 2011* (October 12, 2012). Retrieved from <http://www.haad.ae/HAAD/LinkClick.aspx?fileticket=JY0sMXQXrOU=&tabid=1243>.
 16. *Health Ministry Increases Diabetes Fight*, (April 13, 2009). Retrieved March 25, 2010, from Ministry of Health United Arab Emirates, <http://www.moh.gov.ae/en/NewsDetails461.aspx>.
 17. Abduelkarem, A, "Childhood obesity and type 2 diabetes: a growing public health challenge in UAE," *Diabetes Voice*, 50(3):9–11 (2005).
 18. Anokute, C, "Suspected Synergism Between Consanguinity and Familial Aggregation in Type 2 Diabetes Mellitus in Saudi Arabia," *The Journal of the Royal Society for Promotion of Health*, 111(4):167–169 (1992).
 19. Islam, M, *A Health System Assessment Approach: A how-to manual*, (2007). Submitted to the US Agency for International Development in collaboration with Health Systems 20/20, Partners for Health Reform plus, Quality Assurance Project, and Rational Pharmaceutical Management Plus, Arlington, VA: Management Sciences for Health.
 20. *Id.*
 21. Partners for Health Reform, *Health systems strengthening: An introduction*, (2005), http://www.healthsystems2020.org/files/571_file_01_Chapter_1.pdf.
 22. Islam, M, *supra*, n.19.
 23. Latham and Watkins (2011), retrieved November 20, 2011, from Healthcare Regulation in the UAE, http://www.lw.com/upload/pub-Content/_pdf/pub3951_1.pdf.
 24. *Id.*
 25. *Health Policy and Strategy* (September 13, 2010). Retrieved November 5, 2011, from Dubai Health Authority, <http://www.dha.gov.ae/EN/SectorsDirectorates/Sectors/Health-Policy/Pages/default.aspx>.
 26. *Weqaya Disease Management Programme—Expression of interest*, Abu Dhabi: Health Authority—Abu Dhabi (2011).
 27. Latham and Watkins, *supra*, n.23.
 28. WHO (World Health Organization), *World Health Report 2006: Working Together for Health*. Geneva: WHO 2006, retrieved November 15, 2011, from <http://www.who.int/whr/2006/en/index.html>.
 29. Mourshed, M, Hediger, V, and Lambert, T, *Gulf Cooperation Council Health Care: Challenges and Opportunities*. McKinsey & Company (2009).
 30. *Id.*
 31. *Id.*
 32. Dubai Health Authority, *supra*, n.14.
 33. *Id.*
 34. Health Authority of Abu Dhabi, *supra*, n.15
 35. Dubai Health Authority, *supra*, n.14.
 36. *Id.*
 37. *Key Health Statistics for Abu Dhabi*. Abu Dhabi, United Arab Emirates: Health Authority of Abu Dhabi (2010).
 38. Hajat, C, Harrison, O, and Al Siksek, Z, "Weqaya: A Population-Wide Cardiovascular Screening Program in Abu Dhabi, United Arab Emirates," *American Journal of Public Health*, 1–6 (2011).
 39. Health Authority of Abu Dhabi, *supra*, n.37.
 40. Health Authority of Abu Dhabi, *supra*, n.26.
 41. *Health Ministry Increases Diabetes Fight*. (2009, April 13). Retrieved March 25, 2010, from Ministry of Health United Arab Emirates: <http://www.moh.gov.ae/en/NewsDetails461.aspx>.
 42. Health Authority of Abu Dhabi, *supra*, n.26.
 43. Edwards, HS, *supra*, n.3
 44. Health Authority of Abu Dhabi, *supra*, n.37.
 45. Dubai Physician—Interview (October 22, 2011) (A. Mosaad, Interviewer).
 46. Mourshed, M, *et al.*, *supra*, n.29.
 47. Marketing Executive—Interview (November 11, 2011) (A. Mosaad, Interviewer).

48. Al Haddad, A, *Appetite to put calorie count on the menu* (September 3, 2011). Retrieved November 22, 2011, from The National, <http://www.thenational.ae/news/uae-news/health/appetite-to-put-calorie-counts-on-the-menu>.
49. *Id.*
50. RAK kicks off campaign to promote healthy eating habits among students (March 18, 2010). Retrieved April 20, 2010, from The Free Library, <http://www.thefreelibrary.com/RAK+kicks+off+campaign+to+promote+healthy+eating+habits+among...-a0221385336>.
51. *Walk for Life* (November 25, 2011). Retrieved November 26, 2011 from Diabetes UAE 2011, <http://www.diabetesuae.ae/walk-life-1>.
52. *Id.*
53. *NBA star Kobe Bryant to visit UAE to raise diabetes awareness* (June 19, 2013). Retrieved from <http://www.thenational.ae/news/uae-news/health/nba-star-kobe-bryant-to-visit-uae-to-raise-diabetes-awareness>.
54. Younis, M, "Comparative effectiveness research and challenges to healthcare reform in Middle East and USA," *Journal of Comparative Effectiveness Research*,2(3): 223–225 (May 23, 2013).

Determinants of Differentials in Pneumonia Mortality in the UK and France

Rizwan ul Haq, Patrick Rivers, and Muhammad Umar

Pneumonia is one of the major causes of death in the world. Age-adjusted mortality from pneumonia in the United Kingdom was three times higher than it was in France in 2004. The purpose of this article is to find the underlying determinants of pneumonia mortality differences between these two countries. The main research question is “what are the determinants of pneumonia mortality in the UK and France?” Reviewing the underlying determinants of health inequalities, we expected that behavioral factors, environmental factors, and the health care system would account for the differences, but they do not actually account for much of the differences in Pneumonia mortality between the UK and France. The main difference is due to data quality problems particularly relating to diagnosis and certification in both countries.

Key words: *pneumonia, mortality differentials*

1. Introduction

1.1. Background

Pneumonia is an inflammatory lung disease normally caused by bacteria, a virus or chemical irritants. Moreover any lung injury or illness such as lung cancer or alcohol abuse may also cause the disease. Pneumonia belongs to a respiratory disease group that ranks among the top 10 causes of death in the world. Viruses cause half the reported pneumonia cases and are believed to cause less severe illness than bacteria-caused pneumonia.¹

Pneumonia is more common in the United Kingdom (UK) than in France. Age-standardized mortality from respiratory diseases was about 67 per 100,000 people in the UK and 27 per 100,000 people in France in 2010.²

Pneumonia is considered as one of the fatal respiratory diseases. Children and elderly people most commonly get pneumonia, and the autumn or winter are the two seasons in which most of the pneumonia cases are reported.³

The symptoms depend on the severity and type of infection. Most common complica-

tions include pleural effusion (an accumulation of fluid around the lungs), breathing difficulties, septicemia (a spread of the infection to the patient’s blood), and the most dangerous one, blood poisoning.⁴

The main determinants of pneumonia mortality include environmental, demographic, and behavioral factors, as well as the health care system of a country. Being in poor health, old age, smoking, alcohol abuse, heart disease, lung diseases, and low immunity to infection (AIDS) are among the major predisposing factors for pneumonia. A pneumococcal vaccine is available for preventing pneumonia caused by *Streptococcus*

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pneumonia infection. Eradication of bad habits including smoking and drinking may also reduce the susceptibility of pneumonia.

1.2. Research Question and Objective

The main objective of this study is to find out the main determinants of differences in pneumonia mortality between the UK and France. The main research question is “what are the determinants of pneumonia mortality in the UK and France?” The specific research questions are:

- What is pneumonia, and what are its causes and prevalence?
- What are the differences in the socio-economic and demographic characteristics of populations of the UK and France?
- What are the differences in behavioral and environmental factors in the subject populations and how do these differences relate to differences in pneumonia mortality?
- How do the health care systems of the two countries differ?

The article is organized in to five sections. In section one research questions with the objective of the article are discussed. Section two deals with theory and conceptual framework. Data sources and methods are discussed in section three. Section four contains the results followed by the conclusion in section five.

2. Theory and Conceptual Framework

2.1. What Is Pneumonia?

Bacteria are the main cause of the infection leading to “typical pneumonia,” including *Streptococcus pneumoniae*, which causes

pneumococcal pneumonia. Other microorganisms that can cause other forms of pneumonia are classed as “atypical pneumonia” and include Legionnaire’s disease (caused by a bacterium) and SARS (severe acute respiratory syndrome, which is caused by a virus). Moreover, Pneumonia can be non-infectious and is normally known as “aspiration pneumonia.” The major cause of this type of pneumonia includes inhaling substances, such as caustic chemicals, food, or vomit, into the lungs.

The symptoms of pneumonia include fever, dry cough, headache, muscle pain, weakness, and increasing breathlessness, which are similar to influenza symptoms. The symptoms may be quite acute beginning with a dry cough and eventually progressing to a cough with a green/yellow or rust-colored smelly phlegm.

A few immunizations are available to prevent the causes of pneumonia. For example, *Haemophilus influenzae* type B vaccine (“Hib” vaccine) prevents flu. Normally a single dose of the vaccination is given on annual basis to babies, to the elderly, and to those with chronic lung, heart, or kidney diseases, or with a weakened immune system.⁵

2.2. Theory

Pneumonia morbidity and mortality may vary with age, sex, ethnicity, and related demographic characteristics. As mentioned above, the elderly, children and those with certain health problem, including chronic obstructive pulmonary disease (COPD), diabetes, diabetes mellitus, congestive heart failure, and sickle cell anemia. High vulnerable groups include people with AIDS, those undertaking cancer therapy, those who have had an organ transplant, and chronically ill patients.⁶

Thus, pneumonia triggers with a viral upper-respiratory-tract infection or, among the elderly, with flu, and in most case people with some pre-existing conditions, infections, or weakened immune systems fall prey to this disease.

Studies on the influence of gender as a risk factor for pneumonia provide contradictory results. According to “An Atlas on Mortality in the European Union,” produced by the European communities, influenza and pneumonia are responsible for 3 percent of male deaths and 4 percent of female deaths in the European Union.⁷ These infectious diseases have a greater impact on female mortality than chronic diseases, in contrast to the situation for men. The large number of older — and hence more susceptible — women explains why the differences in mortality between the sexes are less marked for these pathologies. Others suggest that males as compared with females and Blacks as compared with Caucasians are more likely to get pneumonia.⁸ The latter is mainly attributed to socioeconomic differences between the two groups.

There is a common argument and extensive literature suggesting that behavioral (lifestyle) factors such as smoking, alcohol consumption, diets, and exercise contribute to health inequalities among populations. Smoking is one of the behaviors that predisposes individuals to various diseases and causes premature deaths. Cigarette smoking leads to impaired immune defenses and increases the risk of certain infections.⁹ Further, smoking alters the responsiveness of inflammatory cells and lung function suffers an accelerated rate of decline with age. In a prospective cohort study using data from 40 years of follow-up of smokers, Doll, *et al.*, observed the strongest cause-specific

associations between smoking and respiratory and cardiovascular diseases.¹⁰ However, smoking and pneumonia demonstrated a weak but statistically significant relation for people belonging to various age groups.¹¹

Like smoking, consuming excess alcohol is also a predisposing factor to various diseases.

The vulnerability of alcohol users to various infectious diseases — among those, bacterial pneumonia exerts the strongest association with alcohol use — increases due to its suppressive effects on the immune system; however, the underlying mechanism of such a relationship continues to evolve.¹²

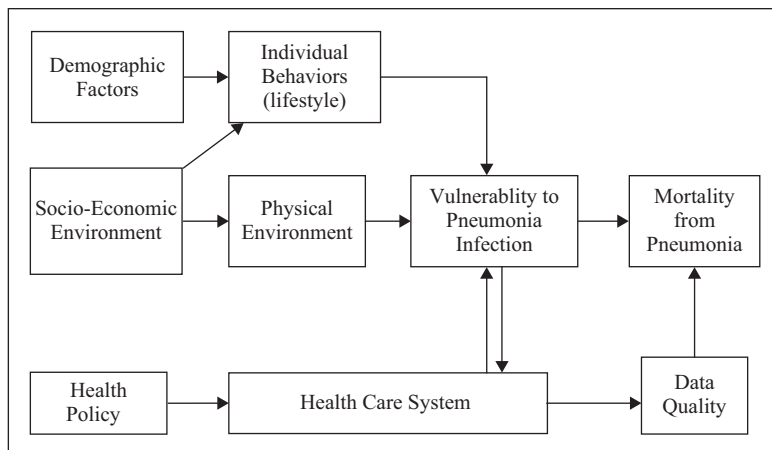
Based on animal experiments, which may not be demonstrated epidemiologically in humans, Pistelli, *et al.*, attributed the ambient air pollution along with smoking as main reason for increasing incidents of respiratory infections.¹³

Components of air pollution, such as ozone and nitrous oxide, and exposure to tobacco smoke damage clearance of bacteria from mouse lungs and increase fatality rates following acute infection.

2.3. Conceptual Framework

Figure 1, below, shows the conceptual framework of the study. The demographic factors of the two subject populations, the UK and France, like the age distribution of the population, have an effect on individual behavior. It has been observed that age is quite important as children and the elderly populations are the most vulnerable groups. The elements of age and gender also have been included in the model because it is assumed that both influence habits, nutrition, lifestyles (sedentary or active), and

Figure 1. Conceptual Framework of the Study



risky behaviors (smoking, drinking, and so on). This behavior affects the vulnerability of the individual to acquire pneumonia and eventually leads to the higher or lower level of mortality caused by pneumonia.

It is assumed that the physical environment, including climate and topography of the country, will have a direct effect on the population's vulnerability to pneumonia. The vulnerability increases in a cold and wet climate, which ultimately increases mortality. Other environmental factors such as pollution, density of population, and congested housing facilities, all are influenced by the socio-economic environment. These factors determine the vulnerability of the individual to acquire pneumonia and eventually will affect the individual's mortality by pneumonia.

The health policies of the countries under study has been given importance, and they are included in the model. The favorable and conducive health policies are supposed to create a better health care system (hospitals, doctors, paramedical staff, clinics, immunizations, and sanitation system). An efficient, need-based, and modern health

care system is assumed to decrease the vulnerability of the individual, while an inefficient and out-of-date health care system is supposed to increase the vulnerability of the individual, which has an ultimate effect on mortality by pneumonia. It is also pertinent to mention that the vulnerability for pneumonia infection also affects the health care system. For instance, if there are a large number of vulnerable people, the health care system may fail to provide better health care facilities and services to them.

The connection of vulnerability to pneumonia to mortality by pneumonia can also pass through the health care system. If the vulnerable population (persons having a greater risk of acquiring pneumonia) is provided with better health facilities and a better care system, they can be cured, or the chances of mortality can be reduced.

3. Data and Methods

As mentioned earlier, age-standardized mortality from respiratory diseases was

about 67 per 100,000 people in the UK and 27 per 100,000 people in France in 2010. These statistics are taken from the Eurostat, and all the diseases in categories J12 to J18 are classified as due to pneumonia from the International Classification of Death (ICD). The actual data is provided by the member countries to the Eurostat. Eurostat has a quality check on the data, which includes consistency checks, to identify incoherent data. The quality of the Eurostat data is subject to classification and the coding procedure in each country, especially in certification processes and diagnosis.

To explain the differences in the death rates due to pneumonia in the UK and France, we used literature review and data on health care utilization, behavior and lifestyle, physical environment, socio-economic status, and demographic characteristics. Health policies in the two countries were also studied. Data quality and comparability was also analyzed.

Secondary data was taken mainly from the World Health Organization (WHO), Eurostat databases, the Office for National Statistics for the UK, and the Institute for Alcohol Studies. Since the data are taken from different sources comparability may be questionable.

4. Results

4.1. Demographic Factors

Mortality from pneumonia in the UK are strikingly high among the European Union (25 countries) according to data from Eurostat. Death rates caused by respiratory disease are significantly lower for France as compared to the UK in 2010: 27 as compared to 67 per 100,000 inhabitants.¹⁴

In addition, it is observed that the age composition of the two populations (France and the UK), as shown in Table 1, is almost similar. In both populations the proportion of children and the elderly is 18 percent and 16 percent respectively in 2012. But, female life expectancy is slightly higher in France than in the UK. Life expectancy at birth is 78 years for males and 85 years for females in France, while it is 78 years and 82 years for males and females respectively in the UK. This means that age does not help to explain the difference in reported pneumonia mortality between France and the UK.

Though data on age-specific incidence of pneumonia is limited for this analysis, it is observed from studies that both the incidence and severity of pneumonia infections are higher among children

Table 1. Population Age Distribution & Life Expectancy at Birth, France & UK, 2004

| Country | Total population | Deaths per 1000 population | % age less than 15 | % age 65+ | Life Expectancy, Male | Life Expectancy, Female |
|---------|------------------|----------------------------|--------------------|-----------|-----------------------|-------------------------|
| France | 63.6 millions | 9 | 19 | 17 | 78 | 85 |
| UK | 63.2 millions | 9 | 18 | 17 | 78 | 82 |

Source: PRB, 2012, http://www.prb.org/pdf12/2012-population-data-sheet_eng.pdf.

younger than five years of age and in the elderly (above 60 years old). In children, the majority of deaths occur among infants. In the UK, the incidence rate of community acquired Pneumonia is estimated at 34 per 1,000 in people aged 75 years and older.¹⁵

Differences in pneumonia mortality between men and women was observed in both the UK and France. Mortality from pneumonia was higher among men than women in both the UK and France.

4.2. Behavioral (Lifestyle) Factors

Smoking and Pneumonia

In the UK half of about 13 million smokers may die prematurely due to smoking with an average loss of eight years of life.¹⁶ Further, about 17 percent of pneumonia deaths were caused by smoking in 2002.¹⁷ In France, it is estimated that 66,000 people die as a result of smoking, and 90 percent of lung cancers are caused by smoking.¹⁸

Alcohol and Pneumonia

In both France and the UK, alcohol consumption is among the highest in world, but with a different trend in the past years. The UK has been a relatively moderate consumer compared to other Western European countries previously. France had one of the highest known levels of alcohol consumption in the world. But, in the last decades, alcohol consumption has fallen in France, while it continued to rise in the UK. Yet alcohol consumption is still higher in France than the UK. Recently it is reported that almost 11 percent of the French population is excessive or dependent drinkers.¹⁹ Young population in the UK have higher percentages

of heavy episodic drinkers as compared to France.²⁰

According to an estimate, about 8,000 to 40,000 people per year die due to alcohol use.²¹ From 1991 to 2005 the death rate for diseases directly related to alcohol use doubled in the UK from 6.9 per 100,000 populations to 12.9, and the majority of the deaths occurred among males.

Physical Exercise

Physical activity and physical fitness are known to be associated with a number of health-promoting behaviors. France and the UK differ in the kinds of sports most commonly practiced by their people. The sports popular in France include basketball, football (soccer), handball, and both codes of rugby football, while in UK the most popular sport is cricket. The sports in France require more activity and alacrity, which can explain the more healthy population in France.

Education and Employment

With an increase in age Britons' participation in full-time education or training declines, and for young Britons the figure is lowest for the entire European Union.²²

The male unemployment rate in the UK is close to the European average of about 25 percent, and the female rate of unemployment, at fewer than 10 percent is the best in the EU. Further, young British males work longer hours as compared to their European counterparts.

4.3. Physical Environment

The physical environment of the two countries differs greatly. The UK is a lowland terrain with some mountains in the Northwest

while France is ringed with mountains. The UK has a temperate climate and temperature ranges from -4 degrees Celsius to 32 degrees Celsius. In France, the average temperature lies between 7 and 23 degrees Celsius. Similarly, in the UK the atmosphere is more humid than France. The difference is greater at night and in winter. In the UK rainfall is much higher in the winter as compared to France. Average daily sunlight is also quite low in the UK as compared to France.²³ So from the above information it is clear that the UK has more rainfall and more humidity as compared to France. And it is suggested that Pneumonia causing microorganisms favor this humid conditions.

There are considerable environmental differences between the UK and France. In December 1991, for example, London experienced a four-day air pollution episode. During the episode, deaths were 23 percent higher than expected, caused by respiratory infections. Consultations with general practitioners rose by 10 percent for upper respiratory and 4 percent for lower respiratory conditions, and hospital admissions of people older than 65 years rose by 19 percent.²⁴ In the UK national emission of nitrous oxide is 130,391 tons as compared to 240,608 tons in France in 2003. If we look at the emission of nitrous oxide from the energy industry, it is 8,937 tons in the UK as compared to 3,290 tons in France. Similarly if we look at the pollution by ozone, it is much lower in the UK (983) as compared to France (4,313).²⁵

4.4. Health Care Facilities

In the UK, general practitioners (GPs) in groups of an average of three GPs provide primary care. In 2002, a GP had to take care of about 1,800 members of the local commu-

nity. A referral is required from these GPs, who work as the gatekeepers, to consult with a specialist. In contrast to the UK, in France self-employed physicians along with salaried staff in hospitals provide primary and secondary health care, and patients have a free choice of physicians. Despite all efforts, including monetary incentives, the newly introduced gatekeeping system did not show any success.²⁶

In terms of the number of hospital beds, France provides better facilities as compared to the UK. In 2002, in France there were 4.2 acute hospital beds per 1,000 population as compared to the UK, which had 3.9 beds in about 240 private acute hospitals, which is less than 5 percent of total beds. On the other hand, France has public (covering two-third of all inpatients beds) and private profit and nonprofit hospitals. Private for-profit hospitals only entertain minor injuries, whereas public and private nonprofit hospitals focus on all other treatments, including emergencies, rehabilitation, long-term care, and psychiatric treatment.²⁷

In France there are about 1.6 million health care professionals who constitute 6.2 percent of the total working population. In 2001, France had 3.3 physicians and 6.9 nurses per 1,000 population as compared to 0.6 GPs per 1,000 population in the UK, which faces a shortage of skilled staff in the NHS.²⁸

Furthermore, both countries have some geographical disparities regarding the organizational structures of the health service providers. In the UK, for example, public health staff may serve at central, regional, strategic health authorities, and the primary care trusts. Similarly, there are geographical disparities in France in the distribution of physicians in favor of urban as compared to rural areas. France's health system is institutionally

complex, which causes tensions between various components of the system.²⁹

The French health care system was ranked at the top by the World Health Organization in 2000 with the population entirely free from chronic diseases.³⁰

Less Funding for Research in the UK

In the UK, despite the obvious severity of lung disease, only 3.8 percent of all money spent by the Medical Research Council on medical research is spent on respiratory disease.³¹ As a result there is a lack of funds to support a great deal of excellent research. It seems that in the UK the current health debate is not about “evidence” but about the political decisions.

4.5 Data Quality

Data on cause-specific mortality rates greatly depends on the reliability of the certification process of deaths. There is evidence that the differences observed in chronic pneumonia between the UK and France depend less on the differences in prevalence between the two countries than on the differences in certification practices. Some of these differences are due to variations in the ways doctors certify deaths, others are due to the way certificates are coded in each country.³² Some of the reasons are due to co-morbidity. When the cause of death is mentioned, chronic diseases like chronic obstructive pulmonary disease (COPD) are mentioned more often than the acute one (pneumonia). Similarly, in death certificates it is difficult to identify all cases of pneumonia as the sole underlying cause of death. In a longitudinal study performed one month after hospitalization in six districts in the Oxford Regional Health Authority area,

pneumonia was mentioned on 86 percent of the death certificates of patients diagnosed with it during hospitalization; only 38 percent mentioned it as the underlying cause of death.³³ The main reason for this difference is misdiagnosis of cause of death mainly on Part I of the certificate, but it is improved after the subsequent International Classification of Diseases (ICD) coding. Second, the category of respiratory diseases such as pneumonia is certainly one of the disease groups most difficult to certify.

Biases potentially affect all causes of death, and this can be particularly serious for diseases of the respiratory system, which are subject to greater variability in certification.³⁴ These biases have already been recognized by some studies that outline differences in the UK and France (in the UK, the rates of chronic lung diseases are particularly high, while in France there is a high frequency of nonspecific respiratory diseases). So it will be difficult to compare specific pneumonia disease rates in Europe on the basis of data routines.³⁵

5. Conclusion

In the foregoing sections, an attempt was made to explain the differences in pneumonia mortality between the UK and France. We found that pneumonia, a disease caused by an infection of the lung tissue by bacteria and virus, is more prevalent in the UK than France. Age-adjusted mortality rates from pneumonia were estimated at 33 deaths per 100,000 people in the UK and 9 deaths per 100,000 people in France in 2004.³⁶ To explain this difference, we used data from Eurostat and secondary literature from different sources. We reviewed literature *which explained that some groups of people may*

be more susceptible to pneumonia morbidity and mortality than others, including demographic factors, health-related behaviors, physical and social environments, and access and quality of health care.

However, it was important to find out whether the differences in pneumonia mortality between the two countries were real differences or the result of data quality and comparability problems. According to a study by Eurostat, the largest variation for pneumonia mortality between France and the UK is attributed more to differences in death certification of the disease between the two countries than real differences in prevalence. The certification process has led to a reduction in the reliability percentages in France in particular.

Apart from the data problem, little differences were found with regard to the determinants of pneumonia between the two countries. With regard to demographic factors, for instance, although it was observed that the very old and the very young population are at particular risk from pneumonia, possibly due to their weakened (low) defense system, the UK and France do not

differ significantly in their population composition. Smoking and alcohol consumption are probably important factors to explain differences in pneumonia mortality between the two populations.

Differences in sports behavior, education, and employment between the two countries also favor France, although the wet and humid climate of the UK provides a suitable condition for infectious agents.

More important are the differences in the health care system of the two populations in which France was found to have a better health care system than the UK. In 2002, the UK had 3.9 hospital beds per 1,000 population while that of France was 8.4 hospital beds per 1,000 inhabitants. At the same time, there were 0.6 GPs per 1,000 population in the UK, while there were 3.3 physicians per 1,000 population in France in 2002. This would mean that there is less access to secondary and tertiary care in the UK than in France. Similarly, while Pneumonia is more prevalent in the UK, it was also observed that there was less attention given to research on respiratory diseases and primary care such as childhood immunization in the UK.

REFERENCES

1. NHS Direct (2007), pneumonia, <http://www.nhsdirect.nhs.uk/articles/article.aspx>, last visited on June 1 2007.
2. http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Causes_of_death_statistics.
3. Mustafa MS, & SV Murthy, "Alcohol-associated admissions to an adult intensive care unit: an audit," *European Journal of Anesthesiology*, 2002 (19): 193–196, Cambridge University Press (2002).
4. NHS (2013), <http://www.nhs.uk/Conditions/Pneumonia/Pages/Complications.aspx>.
5. National Library for Medicine, 2013, <http://www.nlm.nih.gov/medlineplus/druginfo/meds/a607015.html>.
6. Finch, R, "Community acquired Pneumonia; the evolving challenge," *Clinical Microbiology Infection*, 2001(7):30–38 (2001).
7. "Atlas on mortality in the European Union," Health Statistics, Respiratory Diseases (2004).
8. Woodhead, M, Mamun M, Rogers T, and Wort, JS, "Community acquired pneumonia in elderly people," *British Medical Journal*, 1998 (317): 1524 (1998).

9. Burns DN, Hillman D, Neaton, JD, *et al.* Cigarette smoking, bacterial pneumonia, and other clinical outcomes in HIV-1 infection: Terry Beirn Community Programs for Clinical Research on AIDS. *J Acquir Immune Defic Syndr Hum Retrovirol* 1996, 13:374–383
10. Doll R, *et al.*, "Mortality in relation to smoking: 40 years' observations on male British doctors," *British Medical Journal*, 1994, 309: 901–11 (1994).
11. Doll, R, Peto, R, Boreham, J, & Sutherland, I, (2004). Mortality in relation to smoking: 50 years' observations on male British doctors. *Bmj*, 328 (7455), 1519.12 *Supra*, n.3.
13. Pistelli, R, *et al.*, "Determinants of Prognosis of COPD in the elderly: Mucus Hypersecretion, Infections, Cardiovascular Co-morbidity," *European Respiratory Journal* 21(40): 10–14 (2003).
14. [http://epp.eurostat.ec.europa.eu/statistics_explained/index.php?title=File:Causes_of_death_-_standardised_death_rate,_2010_\(1\)_\(per_100_000_inhabitants\).png&filetime_stamp=20121022145128](http://epp.eurostat.ec.europa.eu/statistics_explained/index.php?title=File:Causes_of_death_-_standardised_death_rate,_2010_(1)_(per_100_000_inhabitants).png&filetime_stamp=20121022145128).
15. Hoare, Z & Lim, WS, "Pneumonia: Update on Diagnosis and Management," *British Medical Journal*, 2006 (332): 1077–1079 (2006).
16. Peto, R, *et al.*, *Mortality from smoking in developed countries 1950–2000 (2nd edition)*, Oxford University Press, Oxford (2000).
17. "Mortality statistics," Office for National Statistics, 2002; General Register Office for Scotland, 2002; Registrar General Northern Ireland, Annual Report, Statistics & Research Agency, 2002 (2002).
18. Medical News, available at <http://www.medicalnewstoday.com/medicalnews.php?>.
19. <http://www.ias.org.uk/What-we-do/Publication-archive/Alcohol-Alert/Issue-2-1999/Health-benefits-of-alcohol-debunked.aspx>.
20. http://www.who.int/substance_abuse/publications/alcohol_gender_drinking_problems.pdf.
21. *Institute of Alcohol Studies, Fact Sheet 2006*.
22. NHS, Education, Training and Development (ETD)(2007);<http://www.connectingforhealth.nhs.uk/systemsandservices/etd>, last visited on June 2, 2007.
23. http://www.pettortoise.co.uk/tortoise_climate.php.
24. Macfarlane, A, *et al.*, "Air pollution, climate and health: short-term effects and long-term prospects," Charlton J, Murphy M, eds., *The Health of Ault Britain, 1841–1994, Vol. 1*, London, The Stationery Office, 1997; pp. 187–204 (1997).
25. *Supra*, n.2.
26. *Supra*, n.25.
27. <http://www.euro.who.int/document/e88530.pdf?>.
28. <http://www.euro.who.int/document/e88530.pdf?>.
29. Grosse-Tebbe, S & Figuera, J, *Snapshots of Heath Systems* (2005), http://www.euro.who.int/__data/assets/pdf_file/0010/110242/E87303.pdf.
30. http://www.who.int/whr/2000/media_centre/press_release/en/.
31. British Lung Foundation (2007), http://www.britishlungfoundation.org.uk/documents/BLF_Research.pdf.
32. Kelson, MC, and Heller, RF, "The Effect of Death Certification and Coding Practices on Observed Differences in Respiratory Disease Mortality in 8 EEC Countries," *Revue Epidemiologie et de Sante Publique*, 31(4): 42332 (1983).
33. Goldacre, MJ, "Cause-specific mortality: understanding uncertain tips of the disease iceberg," *Journal of Epidemiology and Community Health*, 47:491–96 (1993).
34. Hatton, F, *et al.* "Bridge coding between ICD-9 and ICD-10 on 5,179 cases." *Meeting of Heads of WHO Collaborating Centres for the Classification of Diseases*, Tokyo, Japan (1996).
35. Rican, F, "Respiratory Diseases," *Comparability and Quality Improvement of European Cause of Death Statistics*, pp. 164–183 (2001).
36. *Supra*, n.2.

