

# Northwest Science Notes

**Donald Patrick Albert**<sup>1</sup>, Department of Geography and Geology, Campus Box 2148, Sam Houston State University, Huntsville, Texas 77341-2148

and

**Ferry Butar Butar**, Department of Mathematics and Statistics, Sam Houston State University, Huntsville, Texas 77341

## Downward Hierarchical Diffusion of Naturopathic Physicians in Oregon from 2000 to 2004

### Introduction

Ideas and phenomena spread across space and time via expansion or relocation processes (Gould 1969). In expansion diffusion “some thing” spreads outward from an origin to engulf an increasing number of proximal individuals or areas until saturation occurs. In relocation diffusion “carriers” of the innovation migrate or hop-and-skip great distances to establish the innovation elsewhere. Other modes of diffusion can operate in conjunction with expansion and relocation diffusion. Contagious diffusion requires person-to-person contact, and is often associated with the transmission of communicable diseases (e.g., Albert 2003). Hierarchical diffusion involves adoptions “leap-frogging” up or down ordered structures such as from large to medium to small-size places. Using a simple example, computed tomography (CT) scanners diffused hierarchically with large hospitals adopting sooner than small hospitals (Baker 1979). More complex phenomena might involve multiple diffusion types such as the hierarchical-contagious spread of AIDS within the United States (Gould 1969). AIDS “jumped” down the urban hierarchy hitting the largest cities first, later medium, and eventually small cities. From these nodes (large, medium, and small cities), AIDS extended outward via contagious diffusion.

The American Association of Naturopathic Physicians (2003) defines an ND as an individual that has attended

a four-year graduate level naturopathic medical school and is educated in all of the same basic sciences as an M.D. but also studies holistic and nontoxic approaches to therapy with a strong emphasis on disease prevention and optimizing wellness. In addition to a standard medical curriculum, the naturopathic physician is required to complete four years of training in clinical nutrition, acupuncture, homeopathic medicine, botanical medicine, psychology, and counseling (to encourage people to make lifestyle changes in support of their personal health). A naturopathic physician takes rigorous professional board exams so that he or she may be licensed by a state or jurisdiction as a primary care general practice physician.

Naturopathic physicians should not be confused with naturopaths. The level of formal education required for NDs distinguishes them from naturopaths who acquire training via a wide range of unorthodox venues. Our study focuses specifically on NDs and excludes naturopaths.

Williams (2000) found that NDs filtered down the urban hierarchy between 1984 and 1993 in Ontario, Canada. She noted the number of medium-sized cities (population = 33,000-99,999) and towns and villages (population < 2,000) with ND's increased in that 10-year span; the number of NDs also increased within all place-size categories except small cities (2,000 - 29,999) where no change occurred. This filtering down, or hierarchical diffusion, from Toronto (metropolitan center >1 million) to smaller-size places corresponded with a 38% increase in the supply of NDs from 1984 to 1993.

The resurgence of naturopathic medicine in the 1990s is spurring more states to adopt licensing

<sup>1</sup> Author to whom correspondence is to be addressed. E-mail: geo\_dpa@shsu.edu

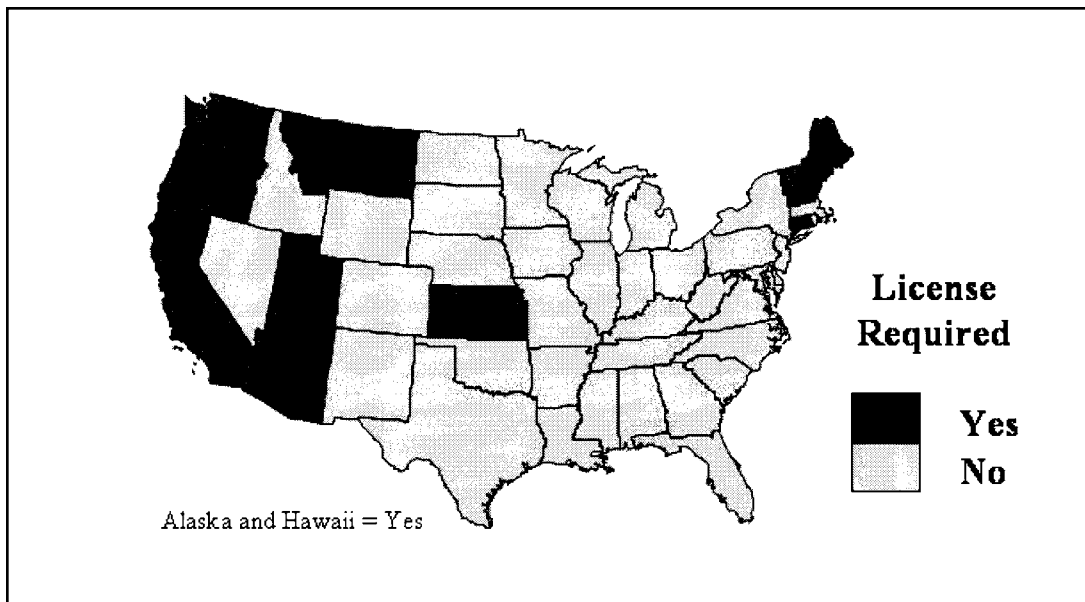


Figure 1. States licensing naturopathic physicians, 2004.

statutes. The latest spurt in licensure started in 1986 with Alaska, and more recently during 2004, with California and Washington, D.C., for a total of eight geographic entities since 1986 (American Association of Naturopathic Physicians 2004; Albert and Butar 2004a). With 13 U.S. states currently licensing NDs, the spread of state statutes is in the midst of the early majority stage of its diffusion process (Figure 1). Since the existing pattern of state licensing is geographically clustered, further adoption is expected to spread contagiously to adjacent nonadopting states (Albert and Butar 2004a). The American Association of Naturopathic Physicians announced that “[I]t is our hope that ALL fifty states will have licensing statutes in place by 2008” (AANP 2003).

Two characteristics describe the current supply of NDs. First, NDs exhibit strong distance decay or decreasing numbers with increasing distance from states’ largest metropolitan areas. Multiple regression analysis and cartographic visualizations have shown NDs cluster in and around Seattle, Washington, Portland, Oregon, Phoenix, Arizona, and Bridgeport, Connecticut. Second, the supply of NDs is increasing dramatically; for example, Washington recorded a 53% increase from 1995-2002, and Arizona a phenomenal 38% increase from October 2000 to November 2001 (Albert and

Butar 2004b). In this paper we test the hypothesis that NDs were diffusing down the urban hierarchy from 2000 to 2004 in Oregon.

### Data and Methods

Data for 2000 and for 2004 were obtained from the Oregon Board of Naturopathic Examiners (OBNE). This database included names and work addresses for all instate/active NDs licensed by Oregon. To these records were added the work city’s total population for 2000 and the most recent estimates for July 1, 2003 (U.S. Census Bureau 2004). Next we divided cities into five size categories based on population: CAT 1:  $\geq 100,000$ ; CAT 2: 25,000-99,999; CAT 3: 10,000-24,999; CAT 4: 2,500-9,999; and CAT 5:  $< 2,500$  (U. S. Census Bureau 2001). We counted both the number of NDs and the number of NDs per 10,000 in each place-size category for 2000 and for 2004. To determine if the number of NDs increased significantly from 2000 to 2004, and if the difference in the number of NDs in each category was statistically significant we used a Poisson loglinear function. Further, we used linear regression to see whether there is a statistical linear relationship between number of NDs per 10,000 in 2000 and in 2004 ( $P=0.05$ ). Here we used number of NDs in 2004 as dependent

variable (y) and number of NDs in 2000 as independent variable (x).

## Results

Oregon experienced a 63.6% increase in NDs from 2000 (N=280) to 2004 (N=458). Portland's supply of NDs alone almost doubled from 125 to 248 during this period. Two factors are pulling NDs to Portland: population size and naturopathic medical school (Pyle 1989; Mattingly 1991). Portland is almost four times the size of Salem and Eugene, the next largest cities in the state. And, the location of the National College of Naturopathic Medicine in Portland is an additional attraction for NDs. Oregon's NDs are clustered similar to those in Connecticut (Albert and Butar 2002), Arizona, and Washington (Albert and Butar 2004b). However, further analysis indicates this increase in workforce is also discernable in lower place-size categories. While change in the number of places with NDs by size category was not remarkable compared to 2000, eight more places in categories 2-5 have NDs in 2004.

For each size category change in the number of NDs from 2000 to 2004 is highly significant ( $p < 0.0001$ ). The number of NDs in 2004 is 1.65 times more than 2000. Further, the increase in the number of NDs is greatest for CAT 1 and decreases moving toward CAT 5 (Figure 2). The number of

NDs in each sized category relative to CAT 5 is 26.1 in CAT 1, 10.5 in CAT 2, 4.7 in CAT 3, and 3.1 in CAT 4. There is a statistically significance relationship between the number of NDs per 10,000 in 2000 and in 2004 for each category, where  $y = -0.794 + 2.06x$  and  $P < 0.0001$ . In Figure 3, note the large increase in the number of NDs per 10,000 in the two smallest place-size categories (CAT 4 and CAT 5).

## Conclusion

Williams (2000) found that increasing the supply of NDs generates a downward hierarchical diffusion. While several differences distinguish the Ontario and Oregon case studies, the overall effect is similar. Two of the major differences between these two studies are the time period (10 years vs. 4 years) and percent workforce growth (42% vs. 64%); nevertheless, both studies point to a downward redistribution of NDs by size categories with increasing supply. Further research is necessary as the workforce continues to expand in Oregon to determine if NDs will continue to move down the urban hierarchy. This study provides support that NDs will enhance access to care and contribute to a more dispersed profession with an increasing workforce supply.

In tracking ND locations down the urban hierarchy, it is important that ND referral patterns

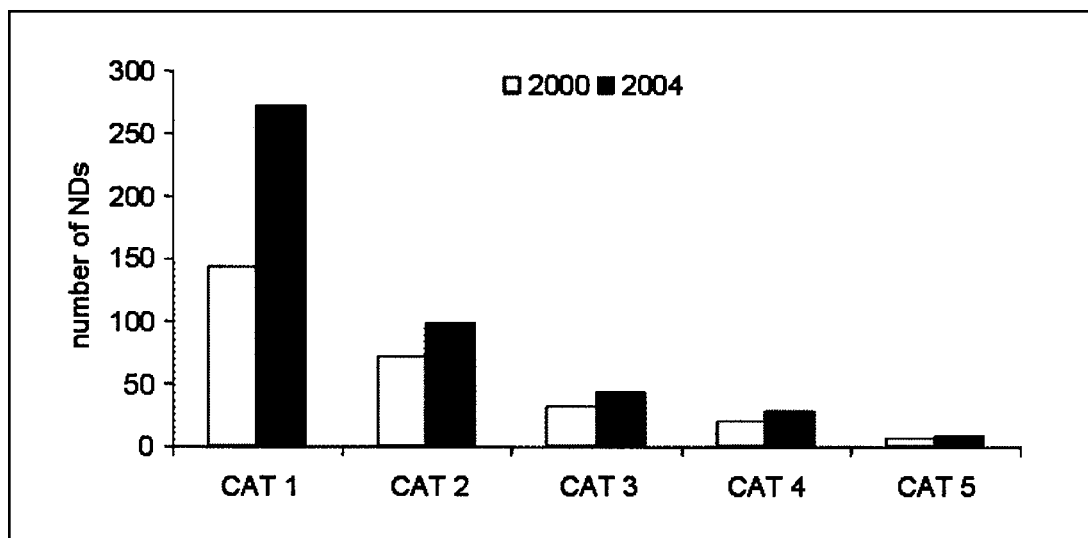


Figure 2. Total number of NDs in each population-size category for 2000 and 2004 (CAT 1:  $\geq 100,000$ ; CAT 2: 25,000-99,999; CAT 3: 10,000-24,999; CAT 4: 2,500-9,999; and CAT 5:  $< 2,500$ ).

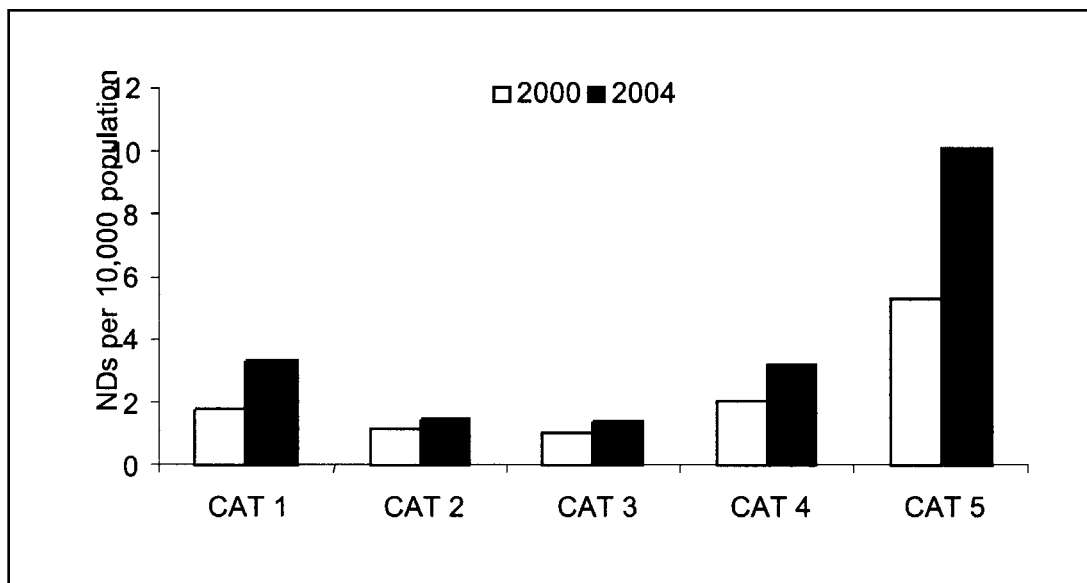


Figure 3. NDs per 10,000 in each population-size category for 2000 and 2004 (CAT 1:  $\geq 100,000$ ; CAT 2: 25,000-99,999; CAT 3: 10,000-24,999; CAT 4: 2,500-9,999; and CAT 5:  $< 2,500$ ).

be documented to see how this complementary and alternative (CAM) provider integrates with bio-medical professionals. Whether NDs refer patients to primary care physician medical doctors

(MDs) or to specialists MDs could determine if the naturopathic services are covered to a larger degree by insurance carriers.

### Literature Cited

- Albert, D. P. 2003 Tracking spatial and temporal patterns of SARS. *Perspective* 31(6):9-11.
- Albert, D. P., and F. B. Butar. 2002. Feasibility of using telephone, association, and licensure directories to examine the geographic distribution of naturopathic physicians in Oregon, Arizona, and Connecticut. *Geography Online [On-line serial]* 3(2):1-8. Available online at [www.siu.edu/GEOGRAPHY/ONLINE/](http://www.siu.edu/GEOGRAPHY/ONLINE/).
- Albert, D. P., and F. B. Butar. 2004a. Diffusion of naturopathic state licensing in the United States and Canada. *Complementary Health Practice Review* 9(3):193-207.
- Albert, D. P., and F. B. Butar. 2004b. Distribution, concentration, and health care implications of naturopathic physicians in the United States. *Complementary Health Practice Review* 9(2):103-117.
- American Association of Naturopathic Physicians. 2003. Frequently Asked Question. Available online at [www.naturopathic.org/asked\\_questions.html](http://www.naturopathic.org/asked_questions.html).
- American Association of Naturopathic Physicians. 2004. A Bill 15-57. Available online at [www.naturopathic.org/news/000385.html](http://www.naturopathic.org/news/000385.html)
- Baker, S. R. 1979. The diffusion of high technology medical innovation: The computer tomography scanner example. *Social Science and Medicine* 13D:155-162.
- Gould, P. 1969. Spatial diffusion. Association of American Geographers, Washington, D.C.
- Mattingly, P. F. 1991. The changing location of physician offices in Bloomington-Normal, Illinois: 1870-1988. *Professional Geographer* 43:465-474.
- Oregon Board of Naturopathic Examiners. 2002 and 2004. OBNE Licensee List 2002 and 2004. 800 NE Oregon St., STE 407, Portland, Oregon.
- Pyle, G. F. 1989. Physician office locations within Charlotte, North Carolina. *Southeastern Geographer* 29:118-135.
- U.S. Census Bureau. 2001. Technical documentation: Census 2000 Summary File 1 [Oregon]. U.S. Department of Commerce, Washington, D.C.
- U.S. Census Bureau. 2004 Annual estimates of the incorporated places in Oregon, listed alphabetically: April 1, 2000 to July 1, 2003. Population Division, U.S. Census Bureau, Washington, D.C.
- Williams, A. M. 2000. The diffusion of alternative health care: A Canadian case study of chiropractic and naturopathic practices. *The Canadian Geographer* 44:152-166.

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