

Dentists in practice-based research networks have much in common with dentists at large

Evidence from the Dental Practice-Based Research Network

Sonia K. Makhija, DDS, MPH ▪ Gregg H. Gilbert, DDS, MBA ▪ D. Brad Rindal, DDS ▪ Paul L. Benjamin, DMD
Joshua S. Richman, MD, PhD ▪ Daniel J. Pihlstrom, DDS for the DPBRN Collaborative Group

Practice-based research networks (PBRNs) aim to improve clinical practice by engaging dental practitioners in studies that are directly relevant to daily clinical practice. The Dental Practice-Based Research Network (DPBRN) consists of dentists from seven U.S. states and three Scandinavian countries. All DPBRN dentists complete an enrollment questionnaire about their practices and themselves; as of this writing, 1,086 have done so. To quantify the similarities between DPBRN dentists and U.S. dentists at large, this article compared DPBRN practice characteristics to those of dentists who responded to the 2004 ADA *Survey of dental practice*, which is not limited to ADA members.

DPBRN dentists were similar to U.S. dentists in terms of gender, race, ethnicity, number of offices, percentage of patients with insurance coverage, number of operatories, patient visits per week, days for a new appointment, and waiting room time. DPBRN dentists were statistically more likely to be recent graduates. The commonalities should increase the likelihood that DPBRN studies will be applicable to U.S. practices, thereby fostering knowledge transfer in both research-to-practice and practice-to-research.

Received: December 13, 2007

Accepted: February 25, 2008

Practice-based research networks (PBRNs) have been in existence in the United States since the 1970s.¹ These networks were created to join practitioners with academicians in developing and answering relevant research questions that can directly affect daily clinical practice.² Traditionally, clinical research projects have been conducted in an academic environment (where less than 1% of Americans receive their health care) and with little to no input from private practitioners.³ The results of studies developed by private practitioners and conducted in their offices—where the majority of Americans receive their care—should be more relevant to clinicians and therefore improve clinical treatment faster than conventional laboratory research, because these results can be applied directly to their clinical treatment.⁴ PBRNs offer unique advantages in that their work has the potential to move scientific

advances into daily practice quickly, to allow clinicians to provide study ideas that they believe are important for research projects, and to foster the sharing of information between practitioners.⁵⁻⁷

In the past, PBRNs have focused on non-dental areas, such as family medicine, internal medicine, pediatrics, and ophthalmology. Recognizing the success of physician-based PBRNs, the U.S. National Institute of Dental and Craniofacial Research (NIDCR) funded three oral health PBRNs in 2005, one of which is the Dental Practice-Based Research Network (DPBRN). These networks are created to answer questions raised by dentists in everyday clinical practice and to evaluate the effectiveness of current strategies to prevent, manage, and treat oral diseases and conditions.⁸⁻¹¹

Since the 1950s, the ADA has periodically collected information on dentists in private practice with

its *Survey of dental practice*. This survey is based on a national probability sample of dentists in private practice in the U.S. and provides the most comprehensive and reliable statistical information on the characteristics of U.S. dentists.¹²⁻¹⁸ It is noteworthy that this survey samples both ADA members and non-ADA members; it has been used in other analyses for describing the population of dentists in the U.S.¹²

If findings from the DPBRN enrollment questionnaire are consistent with the conclusion that practitioners participating in the DPBRN are similar to U.S. dentists, findings from DPBRN studies should be applicable to the larger population of dentists, thereby fostering the transfer of knowledge from research to practice and from practice to research. This article seeks to quantify how similar DPBRN dentists are to U.S. dentists at large and to test the hypothesis that there are

Table 1. Number of dentists who completed a DPBRN enrollment questionnaire, by region.

Region	Number (%)
Alabama/Mississippi	809 (74.5)
Florida/Georgia	130 (12.0)
HealthPartners	44 (4.0)
Permanente Dental Associates	64 (5.9)
Scandinavian countries (Norway, Denmark, Sweden)	39 (3.6)
Total	1,086 (100)

Table 2. Number of general dentists who completed a DPBRN enrollment questionnaire and the first DPBRN study, by region.

Region	Number (%)
Alabama/Mississippi	281 (58.2)
Florida/Georgia	93 (19.2)
HealthPartners	28 (5.8)
Permanente Dental Associates	49 (10.1)
Scandinavian countries (Norway, Denmark, Sweden)	32 (6.6)
Total	483 (100)

no statistically significant differences between these groups. This hypothesis was tested by comparing DPBRN practice characteristics to those of dentists who responded to the ADA 2004 *Survey of dental practice*.

Materials and methods DPBRN enrollment questionnaire

The DPBRN includes dentists and hygienists from Alabama, Florida, Georgia, Minnesota, Mississippi, Oregon, Washington, and Scandinavia. To become a member, practitioners must complete a 101-item enrollment questionnaire. This questionnaire asks for information concerning practitioner characteristics, practice characteristics, and patient characteristics. Some items on the questionnaire were designed to be similar to those on the ADA survey. The DPBRN re-administers the questionnaire periodically to ensure that the information is up-to-date. From 2002–2004, practitioners completed the questionnaire as a paper form; since 2005, practitioner-investigators have completed the questionnaire online. As of April 2, 2007, 1,086 dentists (and 25 hygienists who were excluded from the current analyses) from the five

participating regions had completed the questionnaire.

For two DPBRN regions (Minnesota and Oregon), collaborations were established with two organizations. HealthPartners of Minneapolis, MN is a prepaid, multi-specialty group that provides comprehensive health care; the HP Dental Group is staffed by 58 dentists at 16 clinic locations that serve approximately 100,000 enrollees. This DPBRN region also has a small but growing number of dentists in private practice in the Minneapolis area. Permanente Dental Associates of Portland, OR is a multi-specialty dental group that contracts with Kaiser Permanente Northwest to provide dental services for their prepaid comprehensive health plan members. Permanente Dental Associates includes 110 dentists in 14 dental clinics that offer dental benefits to approximately 180,000 members.

In addition to comparing all dentists enrolled in the DPBRN with dentists who completed the ADA survey, a comparison was made with DPBRN practitioners who completed the first DPBRN study, a questionnaire on assessing caries diagnosis and treatment. This was done to see if there were any significant differences between the

dentists who completed the ADA survey and DPBRN practitioners who are actively participating in the studies, since the data for the present study will come from this subset. Dentists who completed the enrollment questionnaire and who were a general dentist or pediatric dentist, or did some restorative dentistry, were eligible to participate in the first DPBRN study. Of the 970 practitioners who were eligible for Study 1, 523 (including 493 general practitioners) completed it. Table 1 provides the distribution of participants who completed the enrollment questionnaire; Table 2 lists the number of general practitioners who completed both the questionnaire and the first DPBRN study.

ADA 2004 Survey of dental practice

The 2004 ADA *Survey of dental practice* sought to collect information about U.S. dentists, including characteristics of the dentists, their practices, and their patients, as well as information on income and dental fees. The 2004 ADA survey (requesting information about the year 2003) was mailed to more than 7,000 dentists; 2,671 questionnaires were returned, resulting in an adjusted response rate of 44.0%.¹²

Table 3. Actual percentage or mean numbers (where indicated) of practitioner and practice characteristics for the ADA survey and DPBRN members.

	ADA survey (n = 2,314)*	All DPBRN (n = 1,086)†	U.S. DPBRN (n = 1,047)‡
Practitioner type			
General practitioner	81.3	75.4	76.1
Specialist	18.7	24.1	23.9
Gender			
Male	88.8	83.5	84.0
Female	11.2	16.5	15.3
Race			
White	87.2	93.2	91.6
African-American	2.0	3.6	3.7
Other	8.0	3.2	3.2
Ethnicity			
Hispanic	3.4	1.5	1.6
Non-Hispanic	96.6	98.5	97.0
Year of graduation § 			
Before 1974	23.9	19.0	19.1
1974–1983	37.7	35.3	34.9
1984–1993	25.9	23.3	23.3
After 1994	9.5	22.4	22.6
Number of offices			
One	93.1	87.4	86.5
Two	5.7	11.2	11.0
Three or more	1.2	2.5	2.5
Patients in practice with insurance coverage			
Private insurance	64.0	58.1	59.6
Public insurance	5.7	13.8	11.7
Not covered by any program	30.3	28.1	28.7
Mean number of operatories (SD)			
	4.0 (1.8)	3.5 (1.2)	3.8 (1.4)
Mean number of patients seen/week (SD)			
	60.5 (47.7)	58.0 (49.3)	55.3 (47.5)
Mean number of days new patients must wait for an examination (SD)			
	9.2 (11.3)	10.8 (13.3)	9.7 (12.1)
Mean number of minutes that patients must wait in front area after arriving (SD)			
	7.8 (7.1)	7.7 (7.7)	8.3 (8.1)
All statistical tests were performed using the chi-square test or two-sample <i>t</i> test (<i>p</i> < 0.05 is significant)		‡ Sample size for U.S. DPBRN ranges from 854–1,047 dentists	
* Sample size for the ADA survey ranges from 2,053–2,314 dentists		§ Differences between the ADA survey and All DPBRN are statistically significant	
† Sample size for All DPBRN ranges from 863–1,086 dentists		Differences between the ADA survey and U.S. DPBRN are statistically significant	

The ADA reports its results in seven categories: general practitioners, specialists, both, independent, solo, independent non-solo, and employed. The definition of independent is “a sole proprietor or partner who owns or shares in the ownership of an incorporated or unincorporated dental practice.”¹² The results presented in Table 3 include all private practitioners (general practitioners and specialists) who were independent dentists. This subset was chosen because, with the exception of HealthPartners (whose practitioners are employees), a majority of DPBRN practitioners are considered to be independent dentists. Table 4 is restricted to general practitioners who were classified as independent dentists.

Statistical methods

All DPBRN enrollment data were entered from paper forms into a Structured Query Language (SQL) database. Five percent of submissions were re-entered for quality control. Data from online enrollments were entered into the SQL database. Analytic data sets were extracted, underwent a final quality control analysis, and were converted to SAS (SAS Institute, Cary, NC; 800.727.0025) and SPSS 12.0 (SPSS, Inc, Chicago, IL; 800.543.2185) data sets.

For categorical responses, chi-square goodness-of-fit tests were used to determine differences between the ADA survey item and the DPBRN enrollment questionnaire. Two-sample *t* tests were used to examine continuous responses. In all cases, significance was determined by *p* < 0.05. Because some DPBRN responses were categorized into percentile ranges, a midpoint was assigned to each range to derive an approximate mean and standard deviation for reporting.

This method was used for the variables regarding number of operatories, number of patients per week, number of days that new patients must wait for an examination, and number of minutes patients must wait in the front area after arriving for their appointment.

Results

Table 3 compares the dentists who took the ADA survey to all DPBRN practitioners and to those DPBRN practitioners in the U.S. There were no statistically significant differences between ADA survey dentists and either group of DPBRN practitioners (that is, all practitioners and those in the U.S.), except for graduation year.

For example, 81.3% of those who responded to the ADA survey were general practitioners, compared to 75.4% of all DPBRN participants and 76.1% of U.S. DPBRN participants. In both surveys, approximately 90% of all practitioners worked from a single office.

In terms of race, 87.2% of those in the ADA survey were white; by comparison, 93.2% of all DPBRN practitioners were white, compared to 91.6% of U.S. DPBRN practitioners.¹⁹ In terms of ethnicity, 3.4% of those who responded to the ADA survey were Hispanic, compared to 1.5% of all DPBRN practitioners and 1.6% of U.S. DPBRN practitioners.¹⁹

In terms of insurance coverage for patients, 64.0% of those who responded to the ADA survey said that their patients were covered by private insurance, compared to 58.1% of all DPBRN practitioners and 59.6% of U.S. DPBRN practitioners.

All practitioners in both surveys averaged four operatories in their office, 60 patients per week, a 10-day waiting period for new

Table 4. Practitioner and practice characteristics, in actual percentage or mean number (where indicated), for the ADA survey (limited to general practitioners) and for DPBRN practitioners who completed the first DPBRN study (limited to general practitioners).

	ADA survey (<i>n</i> = 1,498)*	DPBRN Study 1 (<i>n</i> = 493)†
Gender		
Male	88.9	82.8
Female	11.1	17.2
Race		
White	n/a	94.1
African-American	n/a	3.1
Other	n/a	2.9
Ethnicity		
Hispanic	n/a	2.2
Non-Hispanic	n/a	97.8
Year of graduation‡		
Before 1974	25.4	14.4
1974–1983	39.1	40.2
1984–1993	25.8	24.6
After 1994	9.7	20.7
Number of offices		
One	97.4	93.6
Two	2.5	5.7
Three or more	n/a	0.6
Patients in practice with insurance coverage		
Private insurance	64.7	58.4
Public insurance	5.4	14.7
Not covered by any program	30.0	26.9
Mean number of operatories (SD)		
	3.8 (1.5)	4.0 (2.3)
Mean number of patients seen/week (SD)		
	51.2 (25.7)	49.1 (27.1)
Mean number of days new patients must wait for an examination (SD)		
	9.2 (11.3)	10.3 (12.0)
Mean number of minutes patients must wait in front area after they arrive (SD)		
	7.5 (7.0)	8.4 (7.4)

All statistical tests were performed using the chi-square test or two-sample t test ($p < 0.05$ is significant)

* Sample size for the ADA survey ranges from 1,033–1,498 dentists

† Sample size for DPBRN Study 1 ranges from 405–493 dentists

‡ Differences between the ADA survey and DPBRN practitioners who completed Study 1 are statistically significant; number of responses was not sufficient for reliable statistical analysis

patient examinations, and an average waiting time of eight minutes before patients are seen.

However, only 9.5% of the ADA survey participants graduated after 1994, compared to more than 20% of DPBRN practitioners worldwide.

Not all dentists enrolled in the DPBRN have participated in a DPBRN study; only 493 DPBRN general practitioners completed the first one. DPBRN practitioner-investigators were compared to the general practitioners who completed the ADA survey. These results are presented in Table 4. Again, there were no statistically significant differences between these groups, with the exception of graduation year (practitioners who participated in the first DPBRN study typically graduated after those who completed the ADA survey).

Discussion

The results of this study indicate that practitioners who participate in the DPBRN are similar to dentists across the U.S. in terms of gender, race, ethnicity, number of offices, percentage of patients covered by insurance, number of operatories, number of days a new patient must wait for an examination, and number of minutes that patients wait after arriving in the office.

Year of graduation was one characteristic that was significantly different between the survey groups. With the introduction of the online enrollment, younger practitioners may have felt more comfortable completing the questionnaire than their older counterparts. It also is possible that recent graduates may have more of a desire to learn about what is beneficial for their daily clinical practice. In addition, two of the DPBRN regions provide dental care exclusively or primarily in a health maintenance organization (HMO)

context; these environments may attract younger dentists. According to DPBRN data, 42% of Permanente practitioner-investigators graduated after 1994, compared to 33% of DPBRN practitioner-investigators from HealthPartners; by comparison, the percentage of practitioners in the other DPBRN regions who graduated after 1994 ranged from 13–20%.

These results have some limitations. The ADA survey analyses were limited to independent dentists; as a result, a larger percentage of younger dentists who do not own their practices may be under-represented in the subset of the ADA survey that was examined for this article. Limiting the data to independent dentists means that those who practice in HMOs may be excluded from these analyses. This exclusion could explain the differences in graduation year, as the two HMOs in the DPBRN had a higher percentage of dentists who graduated after 1994. In addition, dentists who participate in Permanente are considered to be independent dentists, while practitioners in HealthPartners are not considered to be independent for the purposes of this study.

Conclusion

According to the literature, it takes an average of 17 years to turn even 14% of original research findings into changes in care that will benefit patients, meaning that translating research into daily clinical practice is a slow and highly selective process.²⁰ When research is done in an academic setting, those patients are not typically representative of those who receive care in a private setting; as a result, these studies may not be applicable to many communities.²¹⁻²³

PBRNs have great potential

to speed this process.^{21,22,24-26} If practitioners are involved with the development of the studies and are involved in projects that are relevant to everyday clinical practice, they are more likely to use the results.⁵ Assessing the applicability of PBRN research to the dental community at large is important for evaluating its impact on changing clinical practice.²⁷ Nearly every study conducted by the DPBRN originates from DPBRN practitioner-investigators, which suggests that the results could help to shorten the time gap between determining the results of a study and incorporating those results into clinical practice.²⁴

In a 2003 ADA survey, 80% of ADA members felt that implementing treatment for their patients based on scientific findings was a “critical” or “significant” issue, stressing the importance of the findings from PBRNs.²⁸ It is hoped that the commonalities between DPBRN dentists and dentists nationwide will increase the likelihood that DPBRN studies will be applicable to other practices, thereby fostering knowledge transfer in both the research-to-practice and practice-to-research directions.

Acknowledgements

This investigation was supported by NIH grants DE-16746 and DE-16747. The authors would like to thank Sha Zhu, Statistician at the University of Alabama at Birmingham, for his help with the DPBRN enrollment data and verification of analyses; Thomas P. Wall, Manager of Statistical Research at the ADA Health Policy Resources Center, for his help with the ADA survey data; and Vibeke Qvist, DDS, PhD, DrOdont of the Royal Dental College at the University of Copenhagen, for her assistance with the Scandinavian data.

Disclaimer

Opinions and assertions contained in this article are those of the authors and are not to be construed as necessarily representing the views of the respective organizations or the National Institutes of Health. The informed consent of all human subjects who participated in this investigation was obtained after the nature of the procedures had been explained fully.

Author information

Dr. Makhija is director of communications for the DPBRN and an assistant professor, Department of Diagnostic Sciences, University of Alabama at Birmingham School of Dentistry, where Dr. Gilbert is a professor and chair and network chair of the DPBRN and Dr. Richman is an assistant professor, Division of Preventive Medicine. Dr. Rindal is principal investigator of the Network Chair subcontract with the HealthPartners Research Foundation in Minneapolis, Minnesota, and an adjunct associate professor, University of Minnesota School of Dentistry in Minneapolis. Dr. Benjamin serves on the DPBRN Executive Committee and is in private practice in Miami, Florida. Dr. Pihlstrom serves on the DRBRN Executive Committee and is a general dentist for Permanente Dental Associates in Portland, Oregon. At the time of this study, Dr. Rindal was a member of the DPBRN Executive Committee.

References

1. Pearce KA, Love MM, Barron MA, Matheny SC, Mahfoud Z. How and why to study the practice content of a practice-based research network. *Ann Fam Med* 2004;2(5):425-428.
2. Fagnan LJ, Morris C, Shipman SA, Holub J, King A, Angier H. Characterizing a practice-based research network: Oregon rural practice-based research network (ORPRN) survey tools. *J Am Board Fam Med* 2007;20(2):204-219.
3. Green LA, Fryer GE Jr, Yawn BP, Lainer D, Dovey SM. The ecology of medical care revisited. *N Engl J Med* 2001;344(26):2021-2025.
4. Mjor IA, Gordan VV, Abu-Hanna A, Gilbert GH. Research in dental practice. *Acta Odontol Scand* 2005;63(1):1-9.
5. Mold JW, Peterson KA. Primary care practice-based research networks: Working at the interface between research and quality improvement. *Ann Fam Med* 2005;3 Suppl 1:S12-S20.
6. Green LA, White LL, Barry HC, Nease DE, Hudson BL. Infrastructure requirements for practice-based research networks. *Ann Fam Med* 2005;3 Suppl 1:S5-S11.
7. Lenfant C. Shattuck lecture—Clinical research to clinical practice—Lost in translation? *New Engl J Med* 2003;349(9):868-874.
8. Pihlstrom BL, Tabak L. The National Institute of Dental and Craniofacial Research: Research for the practicing dentist. *J Am Dent Assoc* 2005;136(6):728-737.
9. Tabak LA. Dentistry on the road(map). *J Am Dent Assoc* 2004;135(10):1362-1363.
10. Veitz-Keenan A, Berkowitz GS, Brandes I, Goldbert KL, Hamlin DA, Margolin R, Oen K. Practice-based research networks. A win-win for private practice dentists and the future of dentistry. *NY State Dent J* 2007;73:14-15.
11. Ship JA, Curro FA, Caufield PW, Dasanayake AP, Lindblad A, Thompson VP, Vena D. Practicing dentistry using findings from clinical research. You are closer than you think. *J Am Dent Assoc* 2006;137(11):1488-1494.
12. American Dental Association. The 2004 survey of dental practice. Chicago: American Dental Association;2006.
13. Wall TP, Brown LJ. Recent trends in dental visits and private dental insurance, 1989 and 1999. *J Am Dent Assoc* 2003;134(5):621-627.
14. Brown LJ, Lazar V. Trend analysis of dental practice rent and mortgage expenses: 1989-1995. *J Am Dent Assoc* 1999;130(3):424-430.
15. Brown LJ, Lazar V. Trend analysis of dental expenditures by selected dentist and practice characteristics, 1985-1995. *J Am Dent Assoc* 1998;129(11):1615-1621.
16. Seale NS, Casamassimo PS. Access to dental care for children in the United States: A survey of general practitioners. *J Am Dent Assoc* 2003;134(12):1630-1640.
17. Lazar V. Dental hygienists in the United States: Results of an ADA survey. *J Am Dent Assoc* 1997;128(5):651-653.
18. Brown LJ, Lazar V. Dental expenditures by selected dentists and practice characteristics. *J Am Dent Assoc* 1998;129(10):1474-1479.
19. American Dental Association. Distribution of dentists in the United States by region and state, 2004. Chicago: American Dental Association;2006.
20. Balas EA, Boren SA. Managing clinical knowledge for health care improvements. In: Yearbook of medical informatics: Patient-centered systems. Stuttgart, Germany: Schattauer;2000: 65-70.
21. Green LA, Dovey SM. Practice-based primary care search networks. They work and are ready for full development and support. *BMJ* 2001;322(7286):567-568.
22. Green LA, Hickner J. A short history of primary care practice-based research networks: From concept to essential research laboratories. *J Am Board Fam Med* 2006;19(1):1-10.
23. Tierney WM, Oppenheimer CC, Hudson BL, Benz J, Finn A, Hickner JM, Lanier D, Gaylin DS. A national survey of primary care practice-based research networks. *Ann Fam Med* 2007;5(3): 242-250.
24. Westfall JM, Mold J, Fagnan L. Practice-based research—"Blue highways" on the NIH road-map. *JAMA* 2007;297(4):403-406.
25. Lindbloom EJ, Ewigman BG, Hickner JM. Practice-based research networks: The laboratories of primary care research. *Med Care* 2004;42(4 Suppl):III45-49.
26. Thomas P, Griffiths K, Kai J, O'Dwyer A. Networks for research in primary health care. *BMJ* 2001;322(7286):588-590.
27. Slora EJ, Thoma KA, Wasserman RC, Pedlow SE, Bocian AB. Patient visits to a national practice-based research network: Comparing pediatric research in office settings with the National Ambulatory Medical Care Survey. *Pediatrics* 2006;118(2):e228-e234.
28. Burgess K, Ruesch JD, Mikkelsen MC, Wagner KS; American Dental Association. ADA members weigh in on critical issues. *J Am Dent Assoc* 2003;134(1):103-107.

Published with permission by the Academy of General Dentistry. © Copyright 2009 by the Academy of General Dentistry. All rights reserved.