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THE MOST CITED NATIONS AND AUTHORS PUBLISHED PAPERS ON THE NURSE BURNOUT TOPIC

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Abstract

Burnout is a global problem in service-originated societies, especially among nurses in the healthcare setting. Which nations and authors play a prestigious role in burnout and nursing papers still remain unknown. The aim of this study was to report (i) the top ten author collaboration clusters and (ii) most-cited authors and nations shown on Google Maps. We obtained abstracts from Pubmed Central (PMC) by searching the keywords "nurse and burnout" [All Fields]. A total of 561 articles were retrieved from 2013 to 2017. The AWS based on the Rasch rating scale model (RSM) was applied for quantifying coauthor contributions. The number of citations on publications was collected from PMC for computing metrics in comparison author clusters separated by social network analysis (SNA). Visual dashboards were shown on Google Maps. We found that (i) the most cited authors are Thomas Bodenheimer from the US with a single article (PMID= 25384822 cited 114 times, AIF=113); (ii) Differences in each

index ($p<0.05$) significantly existed among author clusters; (iii) the most number of cited article is the one authored by Thomas Bodenheimer (PMID= 25384822); (iv)the top three counties/areas based on x-index are from the US (9.13), China (6.10), and Spain (5.74). The AWS can be applied to scientific disciplines for understanding the most cited authors and nations on nursing and burnout topics. The visual representations on Google Maps are promising and worth further reinvestigating again in the future.

Keywords: Burnout; Nurse; Pubmed Central; Authorship-Weighted Scheme; Social Network Analysis; Google Maps

Introduction

Burnout is a global problem in service-originated societies, especially among nurses in the healthcare setting. (Hayes, Douglas, & Bonner, 2014; Prapanjaroensin, Patrician, & Vance, 2017; Tahghighi, Rees, Brown, Breen, & Hegney, 2017) Several research studies have reported that burnout affects the physical and psychological well-being of a worker (Hsu, Chen, Yu, & Lou, 2010; Spence Laschinger & Leiter, 2006; Trinkoff, Geiger-Brown, Brady, Lipscomb, & Muntaner, 2006), this worker's organizational well-being (Spence Laschinger, Leiter, Day, & Gilin, 2009) (Alacacioglu, Yavuzsen, Dirioz, Oztop, & Yilmaz, 2009; Garrett, 2008; Halbesleben, Wakefield, Wakefield, & Cooper, 2008), and patient outcomes (Halbesleben, Wakefield, Wakefield, & Cooper, 2008; Spence Laschinger & Leiter, 2006). Maslach (1982) defined burnout as a syndrome of emotional exhaustion, reduced personal accomplishment, and depersonalization that can occur in individuals within people-related jobs, such as healthcare or education. The Maslach Burnout Inventory is validated by extensive research conducted for over 35 years since its initial publication and has been translated into several languages to examine nurse burnout in the workplace (Lee, Chien, & Yen, 2013).

Background

Burnout Issues Around The World

Burnout and stress are now more commonly associated with the nursing profession than ever before (Lee et al., 2013). Burnout in nursing conference had been held on September 7–9, 2017 in Sydney, Australia (Ausmed Education, 2017). The complex combination of stressors brought about by burnout

can result in impaired well-being, costly sick leaves, decreased quality care, and increased risk. Burnout and stress are strongly associated with career misery (Ausmed Education, 2017), leading to the loss of highly experienced nurses from the profession. Combating mental health issues and addressing the vulnerabilities of nurses is necessary to understand the psychology underpinning stress and burnout and to motivate the publication of academic papers promoting the development of the resilience required to prevent these professional dangers from occurring. In this regard, knowledge of the most prominent nations and authors reporting nursing burnout in the literature is required to study.

Burnout And Nurse Papers Are Increasing

According to the Science Citation Index, the rate of growth of scientific publications has declined in coverage over the last 15 years (Larsen & von Ins, 2010). Thus, we aim to disclose which nations and authors contributed most to the field of nursing and burnout.

As of December 10, 2018, over 13695 (or 1953) papers can be found on Pubmed.com by searching for the keyword “burnout” (or “burnout” and “nurse”). The issue of how to fairly determining individual researchers’ achievements (IRA) is faced by us.

Author Weighted Scheme Required To Apply

Author collaborations cause article contributions and allocations that should be meaningful. How to fairly compute the credits for coauthors is challenging for us. Many efforts have been made to author impact factor (AIF) and weight allocation for article bylines (Batista, Campiteli, & Kinouchi, 2006; Hagen, 2008; Jayant, 2005; Petersen, Wang, & Stanley, 2010; Sidiropoulos, Katsaros, & Manolopoulos, 2007). However, we have not seen any that have applied the authorship weighted scheme (AWS) for measuring author IRA in the literature.

Study Aims

The aims of the current study are to report (i) the top 10 author collaboration clusters and (ii) most-cited authors and nations shown on Google Maps

Methods

Data Sources

We obtained 561 abstracts based

on journal articles from PMC by searching the keywords "nurse and burnout" [all fields]. A total number of 1419 citing articles were matched to the citable papers in PMC. The number 355 articles were cited by at least one papers in PMC as well.

Ethical considerations

All data were downloaded from PMC, which means the study is not necessary for the ethical approval according to the regulation promulgated by the Taiwan Ministry of Health and Welfare.

The AWS For Quantifying Coauthor Contributions

We applied the AWS (Chien, Chow, Chang, & Chou, 2018; Chien, Wang, Chang, & Kan, 2018) based on the Rasch rating scale model (RSM) (Andrich, 1978) as Eq. (1). The sum of authorships equals 1 for each paper.

$$W_{ij} = \frac{\exp(\gamma_{ij})}{\sum_{j=0}^{m}\exp(\gamma_{ij})} = \frac{2.72\hat{}\,\gamma_{ij}}{\sum_{j=0}^{m}2.72\hat{}\,\gamma_{ij}}, (1)$$

Where the powers (γ_{ij}) as the ordered author name (i) and the article (j) from m to 0, the author number is m+1, more importance is given to the first (=exp (m), primary) and the last (=exp (m-1) corresponding or supervisory authors. We assume that the others (the middle authors) have made smaller contributions to articles.

Author impact factor (AIF) and other indices used for evaluating IRA

The Author impact factor (AIF) used for evaluating the IRA as Eq.2 (Pan & Fortunato, 2014) :

$$AIF = \frac{\sum Cited.papers.based.on.W_j.}{\sum Citable.papers.\times W_j.in.the.given.yrs}$$

), (5)

Other author-level bibliometric indices, such as h, and x, were calculated in this study (Belikov & Belikov, 2015; Egghe, 2006; Fenner, Harris, Levene, & Bar-Ilan, 2018; Hirsch, 2005). All metrics and AIFs were located on dashboards using SNA and Google Maps to display.

Social Network Analysis Using Pajek Software

In keeping with the Pajek guidelines (Batagelj & Mrvar, 2003) used for social network analysis (SNA), we applied SNA to generate the control file and defined an author as a node that is connected to another one through the edge of a line. Usually, the

relation valued by the weight is defined by the number of connections between two nodes (Chien, Chang, & Wang, 2018; Chien, Chow, et al., 2018; Chien, Wang, et al., 2018). The clusters can be determined by a specific algorithm as named centrality in SNA, see below.

Three main centrality measures (i.e., degree, closeness, and betweenness) are frequently used to evaluate the influence (or power) for an entity (e.g., the author) (Freeman, 1979; Otte & Rousseau, 2002). Accordingly, centrality is an important index to analyze the network. Any individual authors who lie in the center of the social network will be deemed as the most influential role on the network and own the speed to gain information (Zhang, Yu, Fan, & Duan, 2013). In this study, the degree centrality was applied to explore the author's collaborations.

Author Clusters Using SNA to Separate

SNA was applied to determine the representative for each cluster. The algorithm of community partition was performed to identify the clusters. Each author was, in turn, assigned to the designated cluster represented by the author who owns the highest centrality degree in his/her cluster. As such, each author can be matched to his/her metrics and clusters by the author-made MS-Excel module.

The bootstrapping method (Efron, 1979) was used for examining differences in metrics among author clusters. A total of 1000 median metrics were retrieved from the random samples of 100 repetitions on mean values for each metric and cluster. As such, the median and 95% confidence intervals (CI) were obtained for comparing differences in metrics among author clusters by inspecting whether two 95% CI bands were overlaid.

Creating Dashboards on Google Maps

The metrics and partitioned clusters are yielded by author-made modules in MS-Excel and the SNA algorithms in Pajek. We created pages of HyperText Mark-up Language (HTML) used for Google Maps. All relevant bibliometric indices can be linked to dashboards on Google Maps.

Validity and Reliability

All data were validated and downloaded from Pubmed Central (PMC) based on the keywords of “nurse and burnout" in all fields. The reliability can be ensured by the consistency of dealing with the process of

data in all wilds of this study by using the SNA cluster analysis, bootstrapping methods, and the bibliometric indices through a series of formulas and approaches.

Results

TASK1: presenting the most cited author on nurse bullying

The most cited authors is Thomas Bodenheimer from the US with a single article (PMID = 25384822 cited 114 times, AIF=113) (Bodenheimer & Sinsky, 2014) until 2018 with high metrics (Citable = 0.73, Cited = 83.34, AIF = 114, Ag = 83.34, h = 1, g = 1, x = 9.13). Whose another article (PMID= 24610185) (Willard-Grace et al., 2014) cited 13 times was not included due to burnout irrelative to the nurse topic. Interested readers are invited to scan the QR-Code in Figure 1 to see the author's publication outputs in PMC by clicking the specific author bobble.

TASK2: selecting the ten top author clusters with high degree centrality

The top 10 author clusters were separated as shown in Figure 2. The representatives with the most degree centrality (DC) are shown for each cluster. The author Peter Van Bogaert from Belgium earns the highest DC, implying more author collaborations and articles exist. The interested readers are also recommended to scan the QR-coed in Figure 2 to see the detailed information in PMC by clicking the word of publication when the specific author bubble is selected.

TASK3: Comparisons of differences in metrics among clusters

The differences in metrics (i.e., x-index and AIF) were found ($p < .05$), see Figure 3, when any two 95% CI bands were separated from each other.

TASK4: Overall author IRA based on x-index dispersed on a dashboard

The top three counties based on x-index (Fenner, Harris, Levene, & Bar-Ilan, 2018) are from the US (9.13), China (6.10), and Spain (5.74) shown in Figure 4. The US ranks first in the proportion of publications (103, 24.18%) related to nurse burnout topics based on first authors' countries, see Table 1.

Table 1.
Publications Regarding Nursing And Burnout Across Regions And Over The Years

Region	2013	2014	2015	2016	2017	2018	Total	%	x-index
AFRICA	2	4	2	3	1		12	2.82	
South Africa	2	2	1	1	1		7	1.64	4.83
Egypt			1	1			2	0.47	1.79
Ethiopia				1			1	0.23	0.80
Subtotal	0	2	0	0	0	0	2	0.47	
ASIA	9	15	27	34	24	6	115	27.00	
China	3	4	11	9	11	3	41	9.62	6.10
Taiwan	1	1	5	6	1	1	15	3.52	4.00
Turkey	1	1	1	5	5		13	3.05	2.51
South Korea	1	1		6	2		10	2.35	1.67
Japan	2	2	3	1			8	1.88	2.57
Subtotal	1	6	7	7	5	2	28	6.57	
EUROPE	30	13	18	32	45	4	142	33.33	
Spain	5		3	6	12	1	27	6.34	5.74
Italy	5	2	4	3	3	1	18	4.23	5.05
Belgium	4	3	1	1	4		13	3.05	5.06
France	2	1	1	4	3	2	13	3.05	2.00
U.K.	2		1	5	3		11	2.58	2.27
Subtotal	12	7	8	13	20	0	60	14.08	
N. AMERICA	32	16	24	17	31	2	122	28.64	
U.S.	29	13	18	14	28	1	103	24.18	9.13
Canada	2	3	6	3	3	1	18	4.23	4.16
Haiti	1						1	0.23	1.91
OCEANIA	3	2	6	5	3	4	23	5.40	
Australia	3	1	6	3	2	3	18	4.23	4.15
New Zealand		1		2		1	4	0.94	2.27
Palestine					1		1	0.23	1.48
S. AMERICA	2	1	2	2	5		12	2.82	
Brazil	1	1	2	1			5	1.17	2.98
Peru	1			1	2		4	0.94	2.57
Chile					3		3	0.70	1.13
Total	78	51	79	93	109	16	426	100.00	18.67

Discussion

This study found that (i) the most cited authors are Thomas Bodenheimer from the US with a single article (PMID= 25384822 cited 114 times, AIF=113); (ii) Differences significantly existed among author clusters on each index ($p < .05$); (iii) the most number of cited article is the one authored by Thomas Bodenheimer (PMID= 25384822); (iv)the top three counties based on x-index are from the US (9.13), China (6.10), and Spain (5.74).

(Editor's Note: See all Figures at the end of this article.)

Although the h-index (Hirsch, 2005) is a popular author-level metric that measures both the productivity and citation impact of the publications for a scholar or scientist, one of its shortcomings assumes equal credits across all coauthors in an article (Belikov & Belikov, 2015; Egghe, 2006; Fenner et al., 2018). Even many concepts of AIF and AWS have been proposed (Batista et al., 2006; Hagen, 2008; Jayant, 2005; Petersen et al., 2010; Sidiropoulos et al., 2007; Vavrycuk, 2018), we are not aware of any empirical illustration that has successfully provided the computation of quantifying coauthor contributions (Egghe, 2006) as we did to readers.

A total of 2039 authors were included in this study. Most of them were from the US, see Figure 3. We illustrated the author Thomas Bodenheimer with another co-author who published one single article (PMID= 25384822 cited 114 times) and gained a high AIF (=113), but with extremely low h (=1) and g (=1) index. Referring other indices of Ag (=83.34=first author weight of 0.73 * 114) and x (=9.13 =SQRT (83.34). The modified h-index such as h' index (Zhang, 2009/2013) is recommended for increasing discriminative power and using in the future.

Another feature of this study is about providing many MP4 videos to readers for understanding the research processes, see Additional files from 1 to 5. The interested readers are able to mimic the ways and generate metrics on Google Maps. All relevant study data are also provided in Additional file 6.

Besides the author Thomas Bodenheimer (PMID=25384822 cited 114 times) with high AIF=113, the calculation of metrics can be applied to other authors, such as the author Luke Fortney (the US) with yellow bubble at the right bottom side in Figure 1 has one citable article (Fortney, Luchter-

hand, Zakletskaia, Zgierska, & Rakel, 2013) cited 39 times, with metrics of Citable = 0.64, Cited = 24.82, AIF = 39, Ag = 24.82, h = 2, = 1, x = 4.98. Interested readers are suggested to click the bubble of the author in Figure 1 and see the cancer-related articles on nurse bullying in PMC.

The third feature is the dynamic character of the AIFs for examining the change of the author's AIF in a particular period (Pan & Fortunato, 2014). That is, unlike the h-index, which is a growing measure taking into account the whole career path. Even AIF was not considered as a useful bibliometric index to measure author IRA in academics (Hirsch, 2005), the modified h-indexes such as g-index and x-index are recommended to the application in the future, particularly for x-index published in 2018 and with more weights than h-index when measuring IRA.

The fourth feature is to report the outstanding authors of nursing and burnout on dashboards (Figures 1 and 2) which refer to other authors who are going to conduct studies on nurse burnout in the discernible future.

Study Limitations

Although our findings are based on the above analyses, there are several potential limitations that should be overcome in the future. First, all data were linked to PMC which cannot generalize the results to other bibliometric databases.

Secondly, there might be some biases when matching authors because some different authors with the same name exist. Therefore, the result of the author relationship analysis might be influenced by the inaccuracy of the indexing author.

Third, many algorithms have been applied to SNA. The degree centrality used for generating Figures might be different from others using different algorithms.

Fourth, the formula, Eq.1, used in this study is also a special case of the general AWS model. Any change for the parameters (e.g. in Eq. 2) might present different results for authors. Similarly, the assumption of corresponding (or supervisory) authors being the last authors might be challenged. Any parameters changed in our proposed formula would affect the computations of the metrics.

Fifth, the data were extracted from PMC different from those other major citation databases—such as the Scientific Citation Index (SCI; Thom-

son Reuters, New York, NY, USA) and Scopus (Elsevier, Amsterdam, The Netherlands). The results of the most cited authors and nations might be distinct if other databases were applied. Finally, many other topics regarding nurse burnout are required to explore further. For instance, what kinds of keywords or medical subject headings (MeSH) are the most important concepts that need to understand the topics of both nursing and burnout in the future.

Conclusions

The AWS can be applied to other disciplines for understanding the most cited authors and nations on nursing and burnout. The overall knowledge information provided to readers in this study is a pioneer on dashboards for readers who concern the issue of nursing and burnout in academics.

References

Alacacioglu, A., Yavuzsen, T., Dirioz, M., Oztop, L., & Yilmaz, U. (2009). Burnout in nurses and physicians working at an oncology department. Psycho-Oncology, 18, 543-548. doi: 10.1002/pon.1432.

Andrich, D. (1978). A rating formulation for ordered response categories. Psychometrika, 43 (4), 561-573. doi:10.1007/bf02293814

Ausmed Education (2017/5/27). Beating burnout in nursing conference on September 7-9, 2017 in Sydney, Asustralia. 2017/5/27 retrieved at https://www.ausmed.com.au/course/beating-burnout-in-nursing#overview

Batagelj, V., & Mrvar, A. (2003). Pajek - Analysis, and Visualization of Large Networks. In Jünger, M., Mutzel, P., (Eds.) pp.77-103. Graph Drawing Software, Springer, Berlin.

Batista, P. D., Campiteli, M. G., & Kinouchi, O. (2006). Is it possible to compare researchers with different scientific interests? Scientometrics, 68 (1), 179-189. doi:10.1007/s11192-006-0090-4

Belikov, A. V., & Belikov, V. V. (2015). A citation-based, author- and age-normalized, logarithmic index for evaluation of individual researchers independently of publication counts. F1000 Research, 884 (4), 1-6. doi:10.12688/f1000research.707

0.1

Bodenheimer, T., & Sinsky, C. (2014). From Triple to Quadruple Aim: Care of the Patient Requires Care of the Provider. The Annals of Family Medicine, 12 (6), 573-576. doi:10.1370/afm.1713

Chien, T.-W., Chang, Y., & Wang, H.-Y. (2018). Understanding the productive author who published papers in medicine using National Health Insurance Database: A systematic review and meta-analysis. Medicine, 97 (8), e9967-e9967. doi:10.1097/MD.0000000000009967

Chien, T.-W., Chow, J. C., Chang, Y., & Chou, W. (2018). Applying Gini coefficient to evaluate the author research domains associated with the ordering of author names: A bibliometric study. Medicine, 97 (39), e12418-e12418. doi:10.1097/MD.0000000000012418

Chien, T.-W., Wang, H.-Y., Chang, Y., & Kan, W.-C. (2018). Using Google Maps to display the pattern of coauthor collaborations on the topic of schizophrenia: A systematic review between 1937 and 2017. Schizophrenia Research. doi:https://doi.org/10.1016/j.schres.2018.09.015

Efron, B. (1979). Bootstrap methods: Another look at the jackknife. The Annals of Statistics, 7 (1), 1-26.

Egghe, L. (2006). Theory and practise of the g-index. Scientometrics, 69 (1), 131-152. doi:10.1007/s11192-006-0144-7

Fenner, T., Harris, M., Levene, M., & Bar-Ilan, J. (2018). A novel bibliometric index with a simple geometric interpretation. PLOS ONE, 13 (7), e0200098. doi:10.1371/journal.pone.0200098

Fortney, L., Luchterhand, C., Zakletskaia, L., Zgierska, A., & Rakel, D. (2013). Abbreviated mindfulness intervention for job satisfaction, quality of life, and compassion in primary care clinicians: a pilot study. Annals of family medicine, 11 (5), 412-20. doi: 10.1370/afm.1511

Freeman, L. C. (1979). Centrality in social networks conceptual clarification. Social networks, 1

(3), 215-239.

Garrett, C. (2008). The effect of nurse staffing patterns on medical errors and nurse burnout. AORN Journal, 87 (6), 1191. doi: 10.1016/j.aorn.2008.01.022.

Hagen, N. T. (2008). Harmonic allocation of authorship credit: source-level correction of bibliometric bias assures accurate publication and citation analysis. PLOS ONE, 3 (12), e4021-e4021. doi:10.1371/journal.pone.0004021

Halbesleben, J. R. B., Wakefield, B. J., Wakefield, D. S., & Cooper, L. B. (2008). Nurse Burnout and Patient Safety Outcomes: Nurse Safety Perception Versus Reporting Behavior. Western Journal of Nursing Research, 30 (5), 560-577. doi:10.1177/0193945907311322

Hayes, B., Douglas, C., & Bonner, A. (2014). Predicting emotional exhaustion among haemodialysis nurses: a structural equation model using Kanter's structural empowerment theory. Journal of Advanced Nursing, 70 (12), 2897-2909. doi:10.1111/jan.12452

Hirsch, J. E. (2005). An index to quantify an individual's scientific research output. Proceedings of the National Academy of Sciences of the United States of America, 102 (46), 16569. doi:10.1073/pnas.0507655102

Hsu, H.-Y., Chen, S.-H., Yu, H.-Y., & Lou, J.-H. (2010). Job stress, achievement motivation and occupational burnout among male nurses. Journal of Advanced Nursing, 66 (7), 1592-1601. doi:10.1111/j.1365-2648.2010.05323.x

Jayant, S. V. (2005). V-index A fairer index to quantify an individual's research output capacity. BMJ, 331 (7528), 1339-1340.

Larsen, P. O., & von Ins, M. (2010). The rate of growth in scientific publication and the decline in coverage provided by Science Citation Index. Scientometrics, 84 (3), 575-603. doi:10.1007/s11192-010-0202-z

Lee, H.-F., Chien, T.-W., & Yen, M. (2013). Examining factor structure of Maslach burnout inven-

tory among nurses in Taiwan. Journal of Nursing Management, 21 (4), 648-656. doi:10.1111/j.1365-2834.2012.01427.x

Maslach, C. (1982). The Cost of Caring. Englewood Cliffs, NJ: Prentice-Hall.

Otte, E., & Rousseau, R. (2002). Social network analysis: a powerful strategy, also for the information sciences. Journal of Information Science, 28 (6), 441-453. doi:10.1177/016555150202800601

Pan, R. K., & Fortunato, S. (2014). Author Impact Factor: tracking the dynamics of individual scientific impact. Scientific reports, 4, 1-7. doi:10.1038/srep04880

Petersen, A. M., Wang, F., & Stanley, H. E. (2010). Methods for measuring the citations and productivity of scientists across time and discipline. Physical Review E, 81 (3), 036114. doi:10.1103/PhysRevE.81.036114

Prapanjaroensin, A., Patrician, P. A., & Vance, D. E. (2017). Conservation of resources theory in nurse burnout and patient safety. Journal of Advanced Nursing, 73 (11), 2558-2565. doi:10.1111/jan.13348

Sidiropoulos, A., Katsaros, D., & Manolopoulos, Y. (2007). Generalized Hirsch h-index for disclosing latent facts in citation networks. Scientometrics, 72 (2), 253-280. doi:10.1007/s11192-007-1722-z

Spence Laschinger, H. K., Leiter, M., Day, A., & Gilin, D. (2009). Workplace empowerment, incivility, and burnout: impact on staff nurse recruitment and retention outcomes. Journal of Nursing Management, 17 (3), 302-311. doi:10.1111/j.1365-2834.2009.00999.x

Spence Laschinger, H. K., & Leiter, M. P. (2006). The impact of nursing work environments on patient safety outcomes: the mediating role of burnout/engagement. Journal of Nursing Administration, 36 (5), 259-267.

Tahghighi, M., Rees, C. S., Brown, J. A., Breen, L. J., & Hegney, D. (2017). What is the impact of shift work on the psychological

functioning and resilience of nurses? An integrative review. Journal of Advanced Nursing, 73 (9), 2065-2083. doi:10.1111/jan.13283

Trinkoff, A., Geiger-Brown, J., Brady, B., Lipscomb, J., & Muntaner, C. (2006). How long and how much are nurses now working? American Journal of Nursing, 106 (4), 60-71.

Vavrycuk, V. (2018). Fair ranking of researchers and research teams. PLOS ONE, 13 (4), e0195509. doi:10.1371/journal.pone.0195509

Willard-Grace, R., Hessler, D., Rogers, E., Dube, K., Bodenheimer, T., & Grumbach, K. (2014). Team structure and culture are associated with lower burnout in primary care. Journal of the American Board of Family Medicine, 27 (2), 229-238. doi:10.3122/jabfm.2014.02.130215

Zhang, C., Yu, Q., Fan, Q., & Duan, Z. (2013). Research collaboration in health management research communities. BMC Medical Informatics and Decision Making, 13 (1), 52. doi:10.1186/1472-6947-13-52

Zhang, C.T. (2009). The e-index, complementing the h-index for excess citations.The e-index, complementing the h-index for excess citations.PLoS One,4 (5):e5429.

Zhang, C.T. (2013). The h'-Index, Effectively Improving the h-Index Based on the Citation Distribution. PLoS ONE 8 (4): e59912.

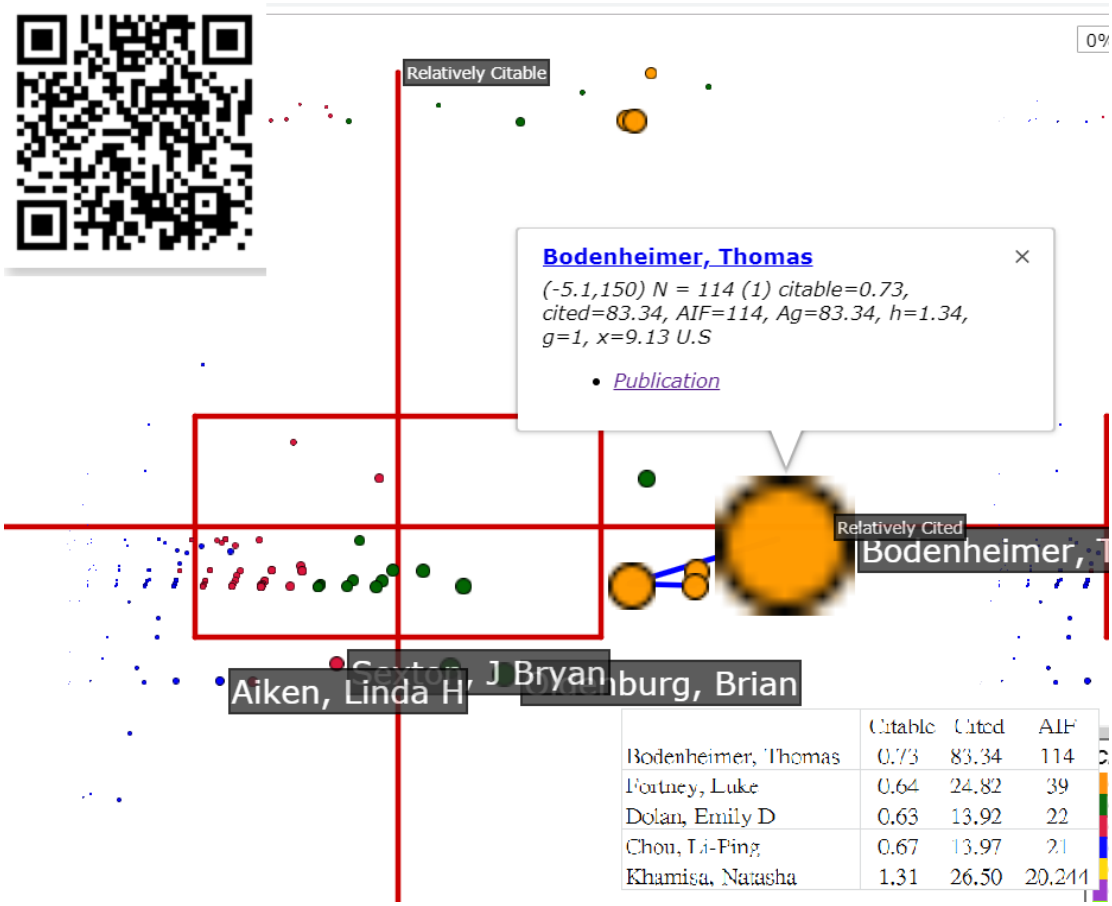

Figure 1. The most cited authors dispersed on a dashboard

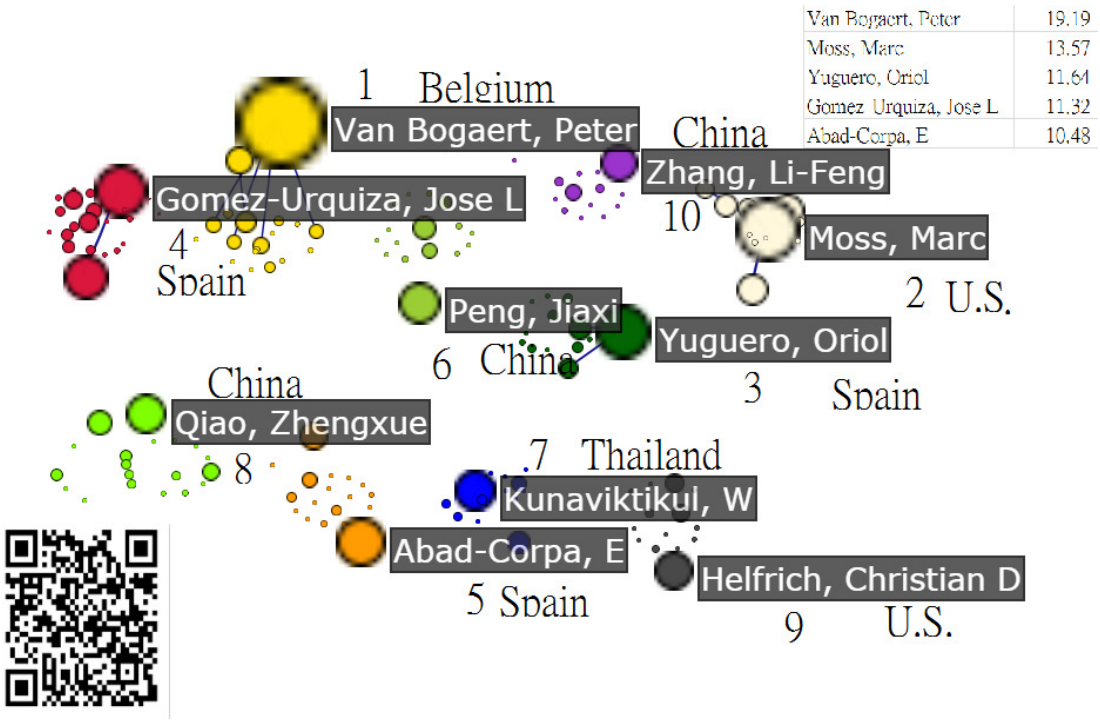

Figure 2. The top ten author cluster dispersed on a dashboard

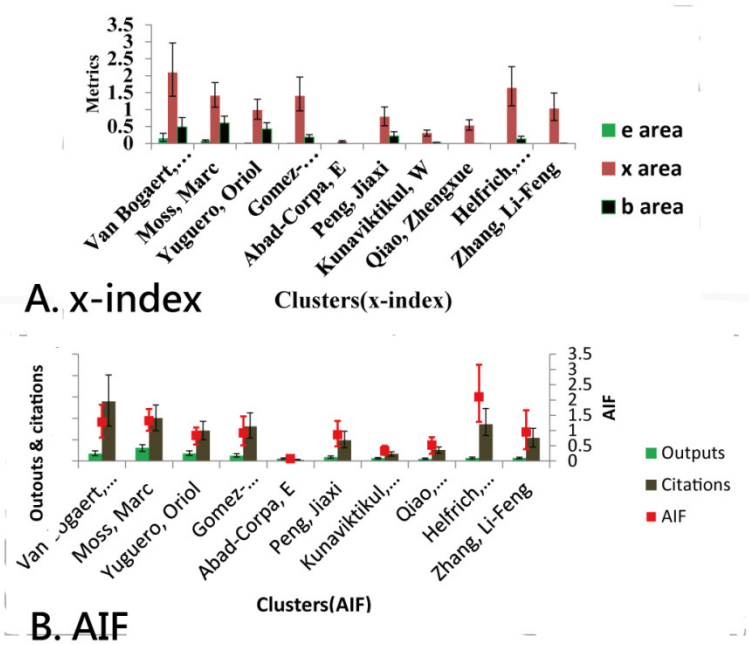

Figure 3. Comparisons of x-index and AIF among author clusters

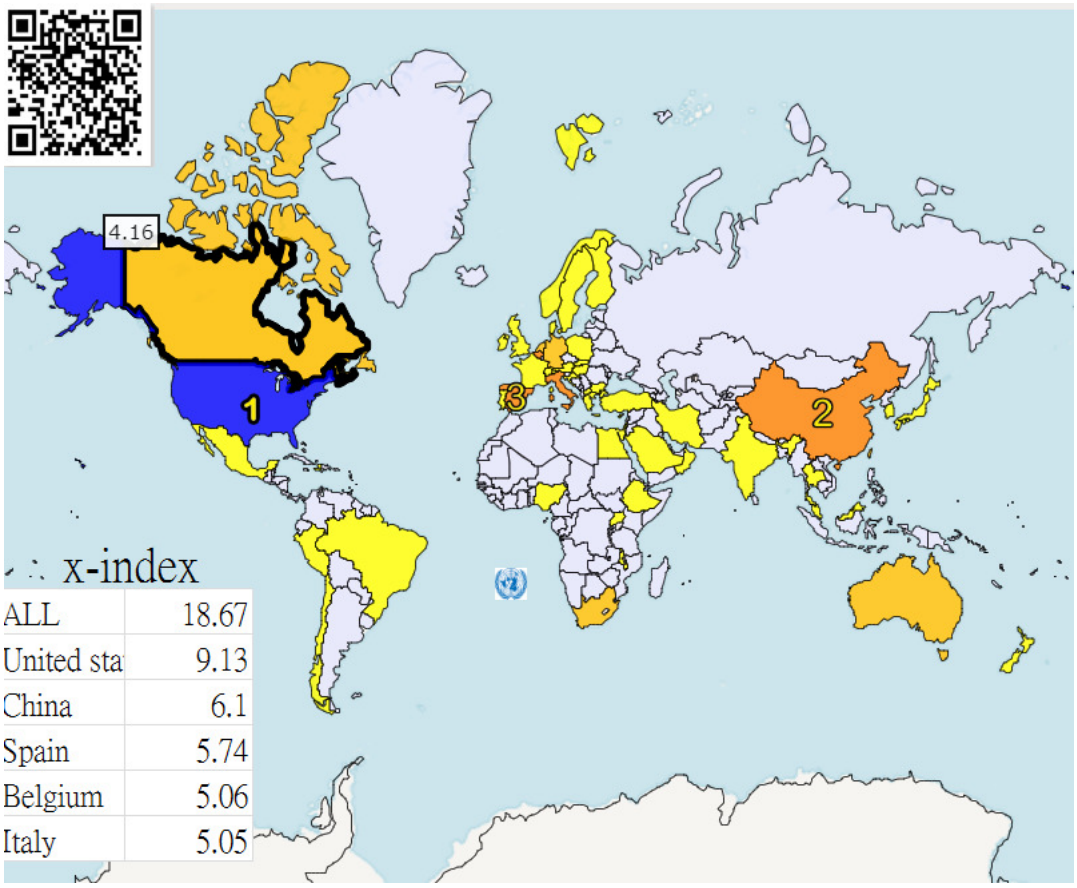

Figure 4. The most cited regions based on author x-index published papers on nurse burnout