

# Online Research @ Cardiff

This is an Open Access document downloaded from ORCA, Cardiff University's institutional repository: <http://orca.cf.ac.uk/117192/>

This is the author's version of a work that was submitted to / accepted for publication.

Citation for final published version:

Toon, M., Collin, V., Whitehead, P. and Reynolds, L. 2019. An analysis of stress and burnout in UK general dental practitioners: sub dimensions and causes. *British Dental Journal* 226 , pp. 125-130. 10.1038/sj.bdj.2019.46 file

Publishers page: <https://doi.org/10.1038/sj.bdj.2019.46> <<https://doi.org/10.1038/sj.bdj.2019.46>>

Please note:

Changes made as a result of publishing processes such as copy-editing, formatting and page numbers may not be reflected in this version. For the definitive version of this publication, please refer to the published source. You are advised to consult the publisher's version if you wish to cite this paper.

This version is being made available in accordance with publisher policies. See <http://orca.cf.ac.uk/policies.html> for usage policies. Copyright and moral rights for publications made available in ORCA are retained by the copyright holders.



# An analysis of stress and burnout in UK general dental practitioners: sub dimensions and causes

Dr Mark Toon, Lecturer in Marketing and Strategy, Cardiff University<sup>1</sup>

Dr Victoria Collin, Research Analyst, British Dental Association<sup>2</sup>

Penny Whitehead, Head of Policy and Research, British Dental Association<sup>2</sup>

Laura Reynolds, Research Associate, Cardiff University<sup>1</sup>

<sup>1</sup>Cardiff University, Cardiff Business School

<sup>2</sup>British Dental Association, Policy and Research

## In Brief:

- GDPs exhibit the highest levels of stress and burnout among UK dentists
- Stress occurs across four dimensions; productivity, work content, patient-led and regulatory
- Levels of productivity stress are higher among GDPs practising NHS treatment
- Practice ownership does not moderate the association between patient-led stress and burnout
- Practice ownership does positively moderate the association between regulatory stress and burnout
- The category of corporate associates positively moderates the association between patient-led stress and burnout

## Abstract

**Introduction:** Dentistry is well documented as a stressful profession. The majority of UK dentists work in general practice, which can carry multiple sources of stress. Previous research has acknowledged the propensity of these sources of stress for General Dental Practitioners (GDPs) when undertaking clinical, administrative and managerial tasks. The results of these accumulative stress sources can lead to burnout among GDPs. Understanding the environmental drivers of stress is an important step in high, and in some reported cases, unsustainable levels of stress and burnout.

**Aims:** To investigate the key dimensions of stress among GDPs and to model causality between these stress subdimensions and burnout as an outcome. To further identify the moderating influence of dentistry type (NHS, private) and performer type (practice owner, associate, corporate associate).

**Materials and Methods:** The data is drawn from an online survey of UK dentists comprising BDA members and non-members. A total of 1513 GDP responses were used in the final analysis. The analysis is conducted using structural equation modelling.

**Results:** We identify four subdimensions of stress in general dentistry; productivity stress, work content stress, patient-led stress and regulatory stress. Each dimension of stress is shown to have a significant causal link to burnout among the GDP population. While burnout levels among this population are already in excess of accepted thresholds, we find that stress is further elevated in specific areas of dentistry type and when performer type is considered.

**Conclusions:** This study contributes across three main areas. First, stress dimensions in general dental practice are identified. Second, these dimensions are shown to have a causal relationship with burnout. Third, specific cases of general dentistry are shown to elevate already problematic areas of stress among general dental practitioners.

## Introduction

Investigation into dentists' wellbeing reveals stress and burnout at consistently high levels.<sup>1</sup> Some studies look at stress alongside other aspects of wellbeing such as physical health,<sup>2</sup> while others have focussed on a more holistic account of stress.<sup>3</sup> Burnout has also received attention in the context of UK dentists,<sup>4</sup> UK medics<sup>5</sup> and medics more broadly.<sup>6</sup> A recent British Dental Association (BDA) survey<sup>7</sup> highlights a significant gap in wellbeing between UK dentists and the general population.

Among UK dentists, GPs fare particularly badly, reporting “significantly higher stress than all other types of dentists”.<sup>1</sup> GPs represent a particular case among front line clinical dentists. They carry direct accountability for their productivity as set out by their practice in the case of performers, and by the local NHS in the case of providers. The organisational context is typically a small business with associated limited functional support that one might expect in larger organisations such as HR, in house training and clear management structures. The resulting environment can prove isolating for the clinical dentist.<sup>8</sup>

A combination of clinical autonomy and accountability and relative isolation may confound stress in patient interactions. Interpersonal conflict is more easily deflected where an employee can readily refer to organisational policy to legitimise their position. GPs are not employees in the conventional sense and policy in small dental businesses is often lacking. This is a weak starting point to address nervous patients who can present as hostile and challenging.

Regulation is conducted at a comprehensive level in UK dentistry and is in part the reason for the high standards in the sector. Conventionally, regulation is undertaken at the organisation level rather than the individual level. Large organisations will have compliance departments to deal with regulatory aspects of the business. Smaller businesses also deal with regulation at the organisation level, although often find themselves challenged for resources. Skills levels across the required subject areas and practical resourcing limitations present challenges to remaining compliant. Dentistry has the usual business regulations overlaid with stringent clinical compliance requirements. Less usual (when compared to other sectors) is that many of these latter regulations are aimed at the individual practitioner rather than the organisation. Sanctions can also be applied against the individual, which differs from many sectors where vicarious liability exists protecting the employee.<sup>9</sup>

These series of factors, from lower levels of support for the dentist, to higher levels of regulatory demands and potential sanctions create a challenging backdrop against which to conduct an already stressful occupation. Leading on from existing research in this area and extending the insight generated from the 2017 BDA Stress and Burnout survey and Collin *et al.*<sup>1</sup> we examine the dimensions of environmental stress that may drive burnout among GPs.

## Conceptualisation and Hypotheses

Dentists identify the throughput of clinical work as an area of stress.<sup>10</sup> Keeping to time and delivering large volumes of complex clinical work carries often unavoidable stress. GPs have arguably the highest throughput of patients per day when compared to other areas of dentistry. These high levels of demand create a pressured productivity line of clinical dental activity. We reason that this is a source of stress among GPs and suggest that:

*H<sub>1+</sub>: Productivity Stress leads to Burnout*

Dentistry carries two exclusive categories of treatment; NHS and private treatments. While each contains an extensive spectrum of dental procedures, the categories attract different charges and hence profit levels. A cost focus on NHS dentistry leads to high throughputs of activity, while private

dentistry typically enjoys more generous scheduling in the working day.<sup>20</sup> NHS treatments using clustered measures of treatment, or units of dental activity (UDAs) create an atmosphere of performance measurement that is particular to this category of treatments. We therefore reason that:

*H<sub>1a+</sub>: NHS dentistry positively moderates the relationship between productivity stress and burnout.*

Work Content can be a source of wellbeing in the workplace. Variety in work and interaction with colleagues at the same level bring a greater sense of work satisfaction and lower levels of stress.<sup>12</sup> Conversely, isolated, repetitive work with little prospect of change reduces morale and can lead to higher stress. We therefore reason that:

*H<sub>2+</sub> work content stress will lead to burnout.*

Since private dental work gives space for lengthier clinical interactions and a wider range of possible treatment options we consider that NHS treatment is likely to confound the stress of Work Content. The NHS has a prescribed range of treatments which is narrower and typically more basic that is available in private dentistry. NHS treatments are also less profitable and so faster throughput is necessary to manage financial performance. We therefore reason that:

*H<sub>2a+</sub>: NHS treatment will positively moderate the relationship between work content stress and burnout.*

Patient led stress refers to the difficulty experienced by dentists in dealing with patients who contribute to interpersonal levels of difficulty. Cooper *et al*<sup>12</sup> refer to these as ‘problem patients’ in their development of the scales used in this study. Myers and Myers<sup>3</sup> consider this dimension of stress as the fragility of dentist patient relationships. Such patients may present as uncooperative, late or anxious. We consider that:

*H<sub>3+</sub>: patient led stress leads to burnout.*

Difficult patient interactions may be handled well where dentists are trained in this area or simply where the dentist has more experience of such situations. Practice owners are a sub-category of GDPs who will typically have greater working experience (the age of practice owners clusters around the 45–54 years category in our data). Practice owners may also have more autonomy to address unhappy patients such as the freedom to issue refunds without consultation with colleagues and may also consider these difficulties as lower priorities when compared to other operational difficulties that they deal with as business owners on a day to day basis. For these reasons we consider that:

*H<sub>3a</sub>: owner negatively moderates the relationship between patient led stress and burnout.*

Associates are likely to have a different profile when considered against this same scenario. The age distribution for associates in our data clusters around the 25 – 34 years age range. Therefore, the associate is typically likely to have lower levels of experience than the owner based on age profile alone. While associates are able to issue refunds, they may feel more restricted in doing so. A sense that they have fewer options may contribute to stress in these situations. We therefore reason that:

*H<sub>3b+</sub>: Associate will positively moderate the relationship between patient led stress and burnout.*

Corporate associates operate in organisations with a particular culture. While this differs by corporate group, common aspects of this culture include a drive towards greater productivity in dental activity and often an emphasis on revenue generation and cost reduction. This differs from their independent

practice counterparts which are typically single practices with less well managed cost structures and comparably less focus on targets. For these reasons we consider that corporate associates will be more troubled by inefficient patient interactions and that they may face tighter constraints on remedies such as issuing refunds. We therefore consider that:

*H<sub>3c+</sub> : corporate associate will positively moderate the relationship between patient led stress and burnout.*

As we have noted, regulatory pressure is applied directly to the dentist who will have accountability for their own clinical performance and competence. Since clinical dentistry is not an exact science and carries scope for interpretation and judgement there is always potential for a challenge to the clinical decisions made. The potential sanctions for proven malpractice can be high, including the loss of registration to practise dentistry in the UK and criminal prosecution. While these more extreme sanctions are invoked rarely they are well communicated to dentists and patients creating a threatening regulatory backdrop. We reason that:

*H<sub>4+</sub> : regulatory stress has a positive relationship with burnout.*

Owners have the same individual concerns relating to regulation, while also bearing addition liability for any (alleged) malpractice among associates and other performers working in their business in terms of reputation to the business. They also have responsibility for regulations relating to the ownership and running of a business such as company accounts and HR legislation. These circumstances lead us to premise that owners are more likely to be affected by regulatory stress than non-owners and we reasons that:

*H<sub>4a+</sub> : owner positively moderates the relationship between regulatory stress and burnout.*

- Figure 1 here -

## **Methodology**

### **Sample**

UK dentists were invited to take part in an online study investigating stress and burnout in dentistry. In total 22,905 dentists including BDA members (13,681) and non-members (9225) were contacted. This resulted in 2053 usable responses (66% BDA members, 34% non members). The response rate was 13% among BDA members and 9.0% overall. From this sample, we selected the 1660 general dental practitioners (GDPs) for inclusion in the present study. The study contained a number of classifier questions (type of GDP, proportion of NHS work and private work) enabling us to identify sub groups among GDPs. In our first group, we look at treatment categories and classify these as NHS treatment only and private treatment only. In our second group, we consider the type of dentist and classify these as practice owners, associates and corporate associates.

### **Missing Values**

Missing data analysis revealed some cases that exhibited high levels, >15% of non-systematic missing values. These 147 (8.9%) cases were removed from the analysis. Acceptable levels of missing values in the behavioural sciences vary by context and field. A figure of 10% is not unusual.<sup>13</sup> In the existing

study we accommodated a margin of 15% to allow inclusion of the few cases where missing values were higher and to reduce the possibility of any negative effect of excessive listwise deletion. This is consistent with the 10% to 15% range identified by de Vaus.<sup>14</sup> Additionally we make the judgement that the sensitive nature of some of the questions tends to generate higher levels of missing values.

Remaining missing values were analysed and found to be missing completely at random (MCAR), meeting the required underlying assumption for the approach used to treat the missing values.<sup>15</sup> Missing values were addressed using Full Information Maximum Likelihood estimation (FIML) which proves an accurate remedy here without compromising the reliability of the analysis. Byrne<sup>16</sup> tests the analysis of a dataset with 25% missing values using this approach and finds a non-significant difference when compared to the full dataset. Ours is a more conservative approach using this method.

- Table 1 here -

## Measures

The conceptual model was operationalised using existing scales from extant studies in this field. Measures of stress were taken from existing scales developed by Cooper *et al*<sup>12</sup> and also used by Myers and Myers.<sup>3</sup> Burnout was measured using the Oldenburg Burnout Inventory (OLBI). The OLBI measure comprises two dimensions, exhaustion and disengagement. In the present study, we collapse these dimensions to achieve an aggregate measure of burnout among GPs. A preceding study of this data<sup>1</sup> has established that GPs report scores on this scale above the threshold for burnout.<sup>6</sup>

## Factor Structure and Structural Analysis

Structural equation modelling has an advantage over regression analysis in that it allows the modelling of latent variables and subsequent simultaneous assessment of the latent paths between these variables. The resulting structural measurement establishes evidence to support both causality, and direction.<sup>17</sup> We employ this approach here to reveal more detail about the dimensions of stress and their relationship to burnout.

Stress and burnout variables were assessed for their factor structure using Confirmatory Factor Analysis. This approach allows us to assess the unidimensionality of the factors and allows us to test our conceptual model against the data. We then test our hypothesised structural paths between latent variables in the structural equation model. Tests for moderation are conducted across the moderators that we identify; NHS only (n 226), practice owners (n 453), associates (n 752) and corporate associates (n 308).

## Findings and Discussion

### Structural Analysis

The measurement model was assessed using maximum likelihood estimation in AMOS 23 software. The resulting confirmatory factor model showed an acceptable fit to the data:<sup>13, 16, 18</sup>  $\chi^2(113) = 1069.282$ ,  $p=0.000$ , CFI=0.94, NNFI=0.94, RMSEA=0.064. The model achieves unidimensionality across the four factor structure for stress. The structural model demonstrated support for each of the

hypothesized latent paths, H<sub>1</sub>, H<sub>2</sub>, H<sub>3</sub> and H<sub>4</sub>, between stress dimensions and burnout. H<sub>1</sub>, Productivity Stress to Burnout  $\beta = 0.65$ ,  $p < 0.01$ . H<sub>2</sub>, Work Content Stress to Burnout  $\beta = 0.67$ ,  $p < 0.01$ . H<sub>3</sub> Patient led Stress to Burnout  $\beta = 0.22$ ,  $p < 0.01$ . H<sub>4</sub> Regulatory Stress to Burnout  $\beta = 0.29$ ,  $p < 0.01$ .

## **Moderation**

We tested for moderating effects of dentistry type on the relationship between productivity stress and burnout (H<sub>1a+</sub> NHS treatment), and between work content stress and burnout (H<sub>2a+</sub> NHS treatment). Using a split group moderation approach, we tested for  $\chi^2$  difference in our two group analysis. Only H<sub>1a+</sub> returned a value above the 5% threshold for 1 degree of freedom at  $\Delta\chi^2 7.57$ . NHS treatment has a positive moderating effect on the relationship between productivity stress and burnout. H<sub>2a+</sub> NHS treatment has a positive moderating effect on the relationship between work content stress and burnout was not supported.

We then tested for the moderating effects of dentist type on the relationship between patient led stress and burnout (H<sub>3a</sub> owner, H<sub>3b+</sub> associate, H<sub>3c+</sub> corporate associate), and between regulatory stress and burnout (H<sub>4a+</sub> owner). Repeating a split group analysis, we again tested for  $\Delta\chi^2$  difference in our two group analysis. We found support for H<sub>3a</sub> ( $\Delta\chi^2 4.42$ ), H<sub>3c+</sub> ( $\Delta\chi^2 6.10$ ) and H<sub>4a+</sub> ( $\Delta\chi^2 4.85$ ). The position of owner negatively moderates the relationship between patient led stress and burnout, the position of corporate associate has the opposite effect and positively moderates the relationship between patient led stress and burnout while the position of owner also positively moderates the relationship between regulatory stress and burnout. H<sub>3b+</sub> associate positively moderates the relationship between patient-led stress and burnout, was not supported.

- Table 2 here -

Against a backdrop of self-reported GDP burnout scores that show that they are experiencing burnout,<sup>6</sup> we have investigated the individual dimensions of stress and tested for differences across sub-groups of dentists. We find that each of our stress dimensions drives burnout when tested against the GDP population. Some stress dimensions have different effects across dentistry types and across sub-types of dentists.

NHS treatment carries time pressures in work. Earnings among dentists are both lower and declining where they perform mainly NHS rather than private treatments (>75% NHS)<sup>19</sup>. One response to this situation is that practices will allocate shorter appointment times to NHS treatments compared to private treatment sessions<sup>20</sup> to address costs and revenue concerns. We find support for the moderating effect of NHS treatment in increasing the relationship between productivity stress and burnout. This suggests that time constraints are a significant source of stress in NHS dentistry. We also considered that work content to be less satisfactory in NHS work and to also increase stress. However, we do not find support for this moderating effect. A logical explanation is that work content, which includes working in isolation and not being able to ask for feedback from colleagues is a similar problem across both dentistry types. Work content stress causes burnout for both NHS and private dentistry types at comparable high levels.

Owners bring experience to their patient interaction and have better access to remedies in situations where patient behaviour is difficult or uncooperative. Their higher skills set in this aspect of their work is complimented by a greater range of options to address problems. For example, owners have complete discretion in issuing refunds. It is likely that the practice owner also has more experience of

complaints and other poor patient interaction and of subsequent resolution. This makes them better placed to judge situations where patients' behaviour is challenging and to know how resolutions may be achieved. We find support for a reduction in the relationship between patient-led stress and burnout among practice owners. This path becomes non-significant for this sub-group of dentists and we find that poor patient interactions do not function as a driver of stress among practice owners.

The rationale given for owners having higher levels of regulatory stress – they have their regulatory concerns as a clinician plus those of their performers along with business legislation – hold true in our analysis and we find that practice owners are significantly more stressed by regulations than the rest of the GDP population. The number of regulatory stressors is higher for practice owners so this finding may seem intuitive. What we don't examine however is the individual contribution of each area of regulation on stress and the cumulative effect of multiple sources of stress captured here. It is possible, and perhaps likely that a confounding effect occurs here.

Lower experience levels among the typically younger associate sub-group of dentists may lead to lower skills when dealing with poor patient interactions. However, when we tested this we did not find a significant difference from the GDP population. Associates remain stressed by this dimension but not to a greater extent than their colleagues. One explanation is that age profile is an ineffective classification of the group difference. While practice owners cluster in the 45 – 54 age range this is not exclusive and many owners who responded to our study fall outside of this range. Further, while associates cluster across the lower age range this is also not exclusive. Thus age as a proxy indicator of experience and also competence is not a robust assumption.

We reasoned that corporate associates work under a different organisational culture which places a greater emphasis on, and management of targets and cost efficiencies. In our analysis we find that this sub-group is more stressed by patient-led stress than their counterparts and attribute this to the relative inefficiency inherent in difficult or uncooperative patient behaviours. We also consider that there may be limited options for redress. Refunds may be discouraged in a cost management culture leaving the corporate associate with fewer options for redress than their colleagues more generally.

GDPs are largely autonomous while on clinic and have varying levels of control over their scheduling. Episodes of work in a given appointment necessarily vary according to what presents and within that decisions are made to carry out or reschedule work depending on the time available. GDPs differ in the effectiveness to which they manage these tight pockets of time across the day with some running consistently to time while others may run consistently behind schedule. Additional factors that influence productivity stress come from outside the surgery and are not easily controlled by the GDP. For example, practices may communicate expected throughput of work, both private and NHS, and seek to drive these through targets. Organisational feedback to dentists on their performance may focus on these productivity figures and compare performance to colleagues within the same practice. Some firms of accountants may use similar comparator measures and include these in their summaries to GDPs each accounting year end. Performance of NHS units of dental activity are agreed through a contract between the practice and local NHS in advance and practice owners may find themselves under pressure to deliver the required volume of UDSs by the year end for fear of punitive contractual clawback which is common in the sector. Collectively these external pressures are transmitted to the dentist and we observe that productivity stress drives burnout and we further find that a higher level of NHS work increases this effect.

We considered that corporate dental practices share a common culture of revenue and cost focus. We did not measure this cultural aspect directly and so proceed in our findings with some caution. However our logic is tested and we find that corporate associates are more affected by patient-led stress than their counterparts. If our assumptions about the productivity pressures are correct then this carries for patient-led stress which is inherently inefficient when viewed from a productivity



perspective. Practice owners feature as an exception within the GDP population here. The status of owner has a negative moderating effect on the link between patient-led stress and burnout. Experience and availability of options are our favoured explanations here. Something that we don't identify is any impact of collegiality on the impact of patient-led stress. The ability to talk to a colleague about a difficult patient encounter may reduce stress markedly and this is something that would benefit from further investigation.

Regulatory stress is by its nature the area of stress that GDPs have least control over. Emphasis is placed on compliance and this serves as the GDPs best defence day to day. However the regulatory environment is complex and may be difficult to navigate leaving the GDP vulnerable to unintentional non-compliance. While ignorance is rarely an effective excuse for non-compliance the GDP is responsible for a large and wide ranging set of regulatory requirements that include clinical regulation, data protection and employment legislation and also tax compliance. For practice owners the regulatory areas increase considerably and we find this to be a particular source of stress leading to burnout for practice owners and a general driver of burnout for the GDP population more broadly. Since these activities fall outside of the focus of training for dentists a lack of knowledge in this area may reduce the prospects for complete and effective compliance to regulatory requirements.

Sanctions for non-compliance can be very high and include loss of registration for the dentist and criminal prosecution. An increase in the litigious behaviour among the patient population and a legal sector that actively drives these behaviours<sup>21</sup> contribute to a hazardous environment for the GDP to navigate and we find regulatory stress to be a consistent driver of burnout among GDPs.

Stress and burnout at work is frequently treated at the level of the individual. Effective solutions to reduce stress and avoid burnout would classically address the root cause(s). While these vary by individual case, our study identifies four categories of stress that are common among the GDP population and we show these to drive burnout. We detail areas of influence that may be brought to bear by GDPs individually. The larger areas of influence that we identify are broader in nature and not readily controlled by the individual GDP. Solutions to the high and damaging levels of stress and burnout will therefore include policy level interventions. While such policy recommendations are beyond the remit of this study they are likely to focus on the areas we identify and effective intervention is also likely to extend to a joined up approach that include cultural change in the sector.

## **Conclusion**

This study makes several important contributions to the understanding of what drives burnout in general dentistry practice. We build on existing understanding of the link between stress and burnout and identify four categories of stress experienced by GDPs. Burnout scores across the population of GDPs are above recognised thresholds. When we break this down across our four categories of stress we find that each category drives burnout. We note that only one of these areas relates specifically to the clinical practice of dentistry. Work content stress captures the stress that GDPs feel in conducting their clinical practice. The other three categories of stress, productivity stress, patient-led stress and regulatory stress are largely environmental conditions that shape the context within which the dentists perform as clinicians. This is an important assessment since it implies that three key areas of stress that cause burnout among dentists are not fully under the control of the dentist.

## **Limitations**

The study draws a representative sample from the population of UK dentists and so may be considered generalisable. Some variation may exist among our sub-types of dentists however and further work is required to assess this. Practice owners vary in their approach to managing a dental practice. Some practices are innovative with a skilled management team and have a growth orientated

business model. Others are smaller, steady practices with limited management skills and lower levels of growth ambition. One might expect to see differences in stress levels across practice managers in these different scenarios.

Associates are also a large group of dentists and our classification of this group as younger and less experienced clearly does not carry for all. Further analysis of this group may reveal sub-groups that exhibit different responses to the stress dimensions examined in this study. Moreover, corporate associates are considered as a homogenous group in this study. Among the many different corporate groups organisational culture is likely to vary and further investigation is required to more accurately represent this group.

## **Recommendations**

This study represents the first substantial work on causality in stress and burnout in the last 13 years. The landscape for dentistry has changed a lot in this time and our study, the preceding study<sup>1</sup> and the 2017 BDA stress and burnout survey have generated great insight into stress and burnout. Further research may generate additional insight by focussing on some key aspects of this landscape change.

For instance, does NHS funding and contract performance generate a greater degree of stress for dentists. If so what are the main aspects of this. When examined across the GDP population such an investigation may reveal pinch points that could be addressed through policy change. Regulation is another key area of stress and a dynamic aspect of the dentistry landscape. Further research into the pressure felt from both particular agencies and specific regulatory requirements may reveal areas for quick reductions in stress among dentists. The alarmingly high levels of stress evident in the sector make such research initiatives an urgent agenda.

## **Acknowledgements**

Thank you to the BDA Trust and the Shirley Glasstone Hughes Trust for funding this research, and all of those who participated.

## References

---

- 1 Collin, V. et al. A survey of stress, burnout and well-being in UK dentists. *Br Dent J* (forthcoming).
- 2 Kay E J, Lowe, J C. A survey of stress levels, self-perceived health and health-related behaviours of UK dental practitioners in 2005. *Br Dent J* 2008; **204**: 19-23.
- 3 Myers H L, Myers L B. 'It's difficult being a dentist': stress and health in the general dental practitioner. *Br Dent J* 2004; **197**: 89-93.
- 4 Denton D A, Newton J T, Bower E J. Occupational burnout and work engagement: a national survey of dentists in the United Kingdom. *Br Dent J* 2008; **205**: 382-383.
- 5 Imo U O. Burnout and psychiatric morbidity among doctors in the UK: a systematic literature review of prevalence and associated factors. *B J Psych Bulletin* 2016; **41**: 197-204.
- 6 Peterson U, Demerouti E, Bergstrom G, Asberg M, Nygren A. Work characteristics and sickness absence in burnout and nonburnout groups: A study of Swedish healthcare workers. *Int J Stress Manag*, 2008; **15**: 153-172.
- 7 Kemp M, Edwards H. Is there a well-being gap among UK dentists? BDA, London. 2015 Available at: [www.bda.org/dentists/policy-campaigns/research/workforcefinance/gp/Documents/Dentists%27%20well-being%20%20report.pdf](http://www.bda.org/dentists/policy-campaigns/research/workforcefinance/gp/Documents/Dentists%27%20well-being%20%20report.pdf)
- 8 Bretherton R, Chapman HR, Chipchase S. A study to explore specific stressors and coping strategies in primary dental care practice. *Br Dent J* 2016; **220**: 471.
- 9 Steele J. NHS dental services in England. London: Department of Health. 2009.
- 10 Rada RE, Johnson-Leong C. Stress, burnout, anxiety and depression among dentists. *J Am Dent Assoc* 2004; **135**: 788-94.
- 11 Shepherd CD, Marchisio G, Morrish SC, Deacon JH, Miles MP. Entrepreneurial burnout: Exploring antecedents, dimensions and outcomes. *Journal of research in marketing and entrepreneurship* 2010; **27**: 71-9.
- 12 Cooper C L, Watts J, Baglioni Jr A. J, Kelly M. Occupational stress amongst general practice dentists. *J Occup Psychol* 1988; **61**: 163-174.
- 13 Hair, J., Black, W., Babin, B., Anderson, R. and Tatham, R. (2006). *Multivariate Data Analysis*. (6th ed). Pearson Education Inc: New York.
- 14 De Vaus D, de Vaus D. *Surveys in social research*. Routledge; 2013.
- 15 Little R J. A test of missing completely at random for multivariate data with missing values. *J Am Stat Assoc* 1988; **404**:1198-1202

- 16 Byrne BM. *Structural equation modeling with AMOS: Basic concepts, applications, and programming*. Routledge; 2016.
- 17 Kline R. *Principles and Practice of Structural Equation Modeling*, 3rd edn Guilford Press. New York. 2011
- 18 Slater SF, Atuahene-Gima K. Conducting survey research in strategic management. In: Ketchen Jr D J, Bergh D D (eds.) *Research methodology in strategy and management*. pp. 227-249. Emerald Group Publishing Limited. 2004
- 19 BDA(2013) The State of General Dental Practice in 2013 *BDA Research Report November 2013*
- 20 Hancock, M., Calnan, M. and Manley, G. Private or NHS General Dental Service care in the United Kingdom? A study of public perceptions and experiences *Journal of Public Health Medicine 1999* 21;. 415-420.
- 21 JFH Law. Dentists Beware- Legal changes from October 2015. Available at <http://jfhlaw.co.uk/dentists-beware-legal-changes-october-2015/> (date accessed: 15.06.18)
- 22 Jacobsen CB, Andersen LB. Performance management in the public sector: Does it decrease or increase innovation and performance? *International Journal of Public Administration* 2014; **37**: 1011-23.

## Figures and Tables captions

Table 1: Demographic Profile of Respondents

GDP Type	n.	Male	Female	Age u. 25yrs	Age 25-34 yrs	Age 35-44 yrs	Age 45-54 yrs	Age 55-64 yrs	Age 65 & over	Prefer not to say
All GDPs	1513	714 47.2%	799 52.8%	42	402	418	384	230	30	7
Owners	453	301 66.4%	152 33.6%	0	27	120	174	114	15	3
Associates	752	277 36.8%	475 63.2%	17	293	219	138	75	9	1
Corporate Associates	308	122 39.6%	186 60.4%	3	112	91	60	38	4	0

Table 2: Hypotheses Results and Findings, latent paths and moderators

Hypotheses (latent paths)		Standardized Estimate	Significance	Finding
H1+	Productivity Stress to Burnout	$\beta = 0.65$	$p < 0.01$	Supported
H2+	Work Content Stress to Burnout	$\beta = 0.67$	$p < 0.01$	Supported
H3+	Patient-led Stress to Burnout	$\beta = 0.22$	$p < 0.01$	Supported
H4+	Regulatory Stress to Burnout	$\beta = 0.29$	$p < 0.01$	Supported
Hypotheses (moderators)		Chi2 difference	Significance	Finding
H1a+	NHS only positively moderates Productivity Stress to Burnout	$\Delta\chi^2 7.57$	$p < 0.05$	Supported
H2a+	NHS only positively moderates Work Content Stress to Burnout	$\Delta\chi^2 0.92$	$p > 0.05$	Not supported
H3a-	Owner negatively moderates Patient-led Stress to Burnout	$\Delta\chi^2 4.42$	$p < 0.05$	Supported
H3b+	Associate positively moderates Patient-led Stress to Burnout	$\Delta\chi^2 2.44$	$p > 0.05$	Not supported
H3c+	Corporate Associate positively moderates Patient-led Stress to Burnout	$\Delta\chi^2 4.42$	$p < 0.05$	Supported
H4a+	Owner positively moderates Regulatory Stress to Burnout	$\Delta\chi^2 4.85$	$p < 0.05$	Supported

Figure 1: Conceptual model of stress dimensions and burnout with moderators

