

The development of a new corporate specific health status measure and its use in the investigation of the relationship between health and well-being and employee productivity.

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Abstract

Background

There is a growing body of evidence linking health and well-being to key business issues. Despite this, corporate uptake of workplace health promotion programmes has been slow outside the USA. One possible reason for this is the lack of a generally available health status measure that is quick and easy to administer and produces data that is rich enough to inform and direct subsequent health promotional interventions.

Methods

We report on the development and validation of the health and well-being assessment (HWB), a health status measure that has been specifically developed for use in the corporate setting. The HWB focuses upon modifiable health issues that directly impact business drivers. Development involved interviews with business leaders, to ascertain their key areas of focus, scientific and general literature review, to find evidence for health status having an impact upon these areas, and end user testing.

2224 employees from three UK based organisations (insurance, telecommunications and consumer goods sectors) completed the HWB, the short-form 36 (SF-36) and the World Health Organisation Health and Work Performance questionnaire (WHO-HPQ) as part of the validation process.

Results

The HWB is a twenty item questionnaire covering 10 areas of health and well-being. Completion of the HWB generates a global health status score and ten sub-scores corresponding to the ten areas covered. It is easy to use and

quick to complete (average completion time 8 minutes) and showed good internal consistency and test-retest reliability. Statistically significant correlations with similar SF-36 variables were observed. A significant negative correlation between HWB score and productivity decrement was observed ($r = -0.4$). Individuals with HWB scores above the 25th centile were more likely to achieve workplace productivity standards than those with scores below the 25th centile (OR 3.62, 95% confidence limits 2.93 – 4.47).

Conclusion

The HWB generates reliable business focused health status data that can be used to direct and target appropriate interventions within corporate populations. It may also be useful in quantifying the financial impact health status issues have upon organisations.

Background:

The last decade has seen increasing interest in the health and well-being of the workforce. This has been driven partly by the increasing burden of direct healthcare costs, which are likely to be exacerbated by the ageing “baby boomer” generation, but also from a recognition that the economy within the developed world has appreciably changed[1,2]. The relative contribution of industry, compared with the service sector, to gross domestic product (GDP) has steadily declined since 1980 to the current level where industry represents approximately 32% of GDP and services 66%[3]. With the shifting structure of the economy have come new challenges to occupational health physicians and human resource managers alike. A predominantly service based economy has fewer tangible assets than its industrialised counterparts and the wealth that is generated is almost completely reliant upon the less tangible “human capital” of employees. It has therefore become an imperative to ensure that this human factor is optimised in order to meet business demands, especially during times of slow economic growth. In parallel with this greater business emphasis on the human factor has come a greater awareness of “post-industrialisation” diseases such as stress and sleep dysfunction, and also conditions such as obesity and musculoskeletal issues, that have arisen due to greater national wealth and an increasingly sedentary lifestyle[4-6].

The evidence for the impact of many lifestyle factors upon long-term health is overwhelming; smoking, excess alcohol intake, poor nutritional status, a sedentary lifestyle and psychological distress have all been associated with

numerous diseases[7-10]. Indeed it has been estimated that about a quarter of all healthcare costs can be attributed to conditions directly resulting from easily modifiable lifestyle factors[11]. As well as the long-term consequences of lifestyle on the genesis of disease there is increasing evidence of the short-term effects such factors have upon individual performance and productivity. Smoking status, body mass index (BMI) and psychological distress have all been shown to have a major impact upon how productive employees are whilst at work[12-14]. Additionally, it has been shown that those individuals who partake in regular leisure time physical activity are less likely to have short-term illness related absenteeism or experience musculoskeletal disorders[15-17].

With these issues gaining greater ascendancy in the corporate world we saw a need for a short, easy to administer questionnaire that could capture this business critical health status data of employees and provide a first step by which organisations could target and monitor appropriate health interventions within their workforce. Although there are a number of general and specific health status measures available for corporate use they are either not well validated, suffer from being too long and cumbersome to administer or cost an appreciable amount to use. In the case of such well-known measures as the SF-36 and general health questionnaire (GHQ), the data that is generated is of limited value in specifically directing health and well-being interventions or in helping managers see the effect poor health status directly has upon their business.

We report on the development and validation of the Health and Well-being (HWB) assessment, a twenty item questionnaire, and its use in assessing the impact employee health status has upon productivity and performance.

Methods:

Questionnaire development

Our principal aim was to develop a questionnaire that focused upon business pertinent health and well-being issues, that was quick and easy to administer and that could serve as a baseline from which employers could start to target health status interventions within their employee populations. We initially surveyed a sample of twelve business managers and executives to ascertain the key issues currently facing their organisations. Interviewees came from four different business sectors, namely (i) Technology (ii) Engineering (iii) Banking and Insurance and (iv) Public sector / Health. Interviews lasted no more than 30 minutes and were semi-structured, asking each interviewee to describe the key issues they faced in their day-to-day operations. We then searched the general and scientific literature for evidence of the effect health parameters have upon the issues identified. The key business issues facing our sample of corporate leaders generally fell into four separate areas. Table 1 shows these four key areas and summarises how health and well-being can directly impact upon them.

Questionnaire development involved one to one interviews and focus group discussions with samples of employees and managers and was an iterative process. This background research and subsequent refinement led us to

construct a 20-item questionnaire covering 10 areas of health and well-being, which we termed sub-indices. The ten areas were:

- Medical health status
- The presence of pain
- Habitual levels of physical activity
- Nutritional balance
- Sleep status
- Symptoms of stress
- Job satisfaction
- Smoking status
- Alcohol consumption
- Body mass index

We used a combination of 5-point Likert scales and structured multi-choice questions. Six of the ten areas were assessed by single item “global” questions, including a modification of the non-exercise estimation of VO_2 max question developed by Jackson and Ross[18]. Body mass index was scored according to desired ranges for the general population, as recommended by the World Health Organisation and the Department of Health. The remaining three areas (nutritional balance, sleep status and symptoms of stress) were assessed by multiple items. The checklist for the medical health question was developed according to current best available evidence for medical conditions impacting upon key business issues[12,19-23]. A single question on self perception of effectiveness at work was also included. Question wording was

modified dependent upon feedback from pilot users and some initial questions were deleted due to significant numbers of individuals finding them not relevant. The answer to each question was scored on a zero to one-hundred scale, this was used as the relevant HWB sub-index for single item variables. The question scores for multi-item variables were averaged to give a zero to one-hundred sub-index score (see appendix for full details of item scoring). The overall HWB score was computed by summing and then averaging all 10 sub-index scores, giving equal weight to each of the ten areas.

Subjects

3000 full time employees of three UK based organisations (one insurance company, one telecommunications company and one consumer goods manufacturer) were invited to complete the questionnaire via the internet. All data transmission utilised 128 bit encryption and all data storage was fully UK Data Protection Act compliant. All participants were required to electronically sign an agreement for their anonymised data to be used in amalgamated format for purposes of research. A draw with a prize of a weekend break was offered as an incentive to participate for each company group. Thirty employees re-took the questionnaire four weeks after the date of their first completion in order to provide test re-test data.

In addition to completing the newly developed questionnaire participants were also asked to concurrently complete the Short Form 36 (SF-36v2) and the World Health Organisation Health and Work Performance (WHO-HPQ) questionnaires in order to assess criterion validity[24,25]. The WHO-HPQ was used to calculate the weekly productivity decrement of each respondent.

For each participant in the study details on age, gender, sickness absence in the preceding 3 months, company position, marital status and weekly working hours were also collected.

Results:

2224 of the 3000 employees invited to participate in the study completed questionnaires (74% response rate). Online completion of the questionnaire ensured that there were no missing data points in completed questionnaires. Mean age was 38.1 years (Standard deviation 10.7). 59% of respondents were female. Age and gender of respondents accurately reflected the demographics of the three company populations as a whole. 22% were regular smokers and 8% regularly consumed more alcohol than current international recommendations for health. The average completion time for the HWB questionnaire was 8 minutes.

Questionnaire validation:

Principal components factor analysis of the three multi-item variables showed that for each the number of factors extracted was 1. Inter-item correlation, as assessed by the Cronbach α value, for each of these three scales was good (see table 2). General linear model analysis indicated that of age, gender, sickness absence, company position, marital status and weekly working hours the only variables that remained a significant predictor of HWB score were sickness absence and age ($p < 0.0001$ for both)

Comparison with SF-36v2 scores

Significant correlations were seen between the SF-36 scales that assessed similar areas of health status as the HWB sub-indices, namely Bodily Pain vs Presence of Pain ($r=0.79$), Mental Health vs Symptoms of Stress ($r=0.70$), Mental Component Summary Measure (MCS) vs Stress ($r=0.71$). Additionally there was a clear association between the overall HWB score and the General Health, and Vitality scores of the SF-36 ($r=0.59$ and 0.49 respectively). All SF-36 multi-item scales were significantly correlated with the overall HWB score ($p \leq 0.01$).

WHO-HPQ data

The 2224 individuals who completed the HWB and the SF-36v2 also completed part B of the WHO-HPQ, which was used to calculate a weekly productivity decrement for each respondent[24]. Mean productivity decrement for the population was 26.4% of weekly working time (SD 20.9), median 20% (25th centile: 10% and 75th centile: 33.5%)

A negative correlation between the HWB score and calculated productivity decrement was observed ($r=-0.4$, $p<0.0001$), i.e. better health status, as measured by the HWB, was associated with a lower weekly productivity decrement (see figure 1)

General linear model analysis indicated that the overall HWB score and age were the only two variables that remained as significant predictors of weekly productivity decrement ($p<0.000001$ and $p=0.000002$ respectively).

The 75th centile figure of 33.5% productivity decrement per week was taken as the cut-off for achieving the productivity standard within the current population. Similarly the lower quartile HWB score of 52.1 was used as the cut-off to define poor health. 2 x 2 table analysis using these cut-offs demonstrates an odds ratio of 3.62 (95% confidence limits, 2.93 to 4.47) for making the productivity standard if HWB score is above the lower quartile value, Chi squares 158.82 (Yates Corrected), $p=0.00000001$.

There was a significant correlation between the single question on effectiveness contained in the HWB and the productivity decrement, as calculated by the WHO-HPQ, ($r= -0.59$, $p<0.00001$).

Test-re-test validity for HWB

Thirty individuals re-took the HWB four weeks after their original completion date. During this time no information or intervention with regard to health and well-being was delivered to them. The correlation between HWB scores at both time points was excellent ($r=0.90$), with no significant differences between mean scores or variance of the data sets.

HWB scores across the population

Table 3 gives the means, medians, standard deviations and inter-quartile values for the HWB score and sub-indices. The distribution of the HWB score was normal, therefore parametric measures were used to analyse differences between independent groups (t-test). There were no significant differences

between the HWB score of males and females or between those who typically worked more than 40 hours and those who did not. There was, however a significant difference in HWB scores between those in senior positions within the company and those within junior positions, (mean HWB scores 62.9 and 60.7 respectively, $p < 0.001$). Similarly, those who had less than 3 days sickness absence in the preceding 3 months had better HWB scores than those who had more sickness absence (means scores 64.0 vs 55.2 respectively, $p < 0.0001$).

Discussion:

The association between employee health status and costs incurred by employers is incontrovertible. Numerous studies have clearly shown how health risk factors directly impact upon medical care costs, short- and long-term absence and workers compensation[11,26-28]. Additionally more recent research is confirming what many of us “intuitively” knew; that the health and well-being of the workforce has a direct impact upon work performance[12]. Despite this growing body of evidence many corporations have been slow to institute appropriate measures to assess, intervene and improve the health of their workforce. The reason for this inertia is unclear, especially as corporate health promotion and management programs have repeatedly been shown to generate a return on investment (ROI)[29-31]. A possible explanation may be that whilst medical care costs are inexorably increasing by focusing solely upon costs and cost savings we miss capturing corporate leaders’ imagination and vision. Combining the message of cost savings with productivity and performance enhancements may just strike the right balance. Measures such

as the WHO-HPQ now allow us to objectively measure productivity and, as we have confirmed in this paper, health status is an integral component of this construct.

As already mentioned, although well-established questionnaires have been extensively validated in many different populations the data that is generated is often of limited value in specifically directing health and well-being interventions, or in helping managers see the effects poor health status directly has upon their business. We have presented the first steps of the development and validation of a health status measure specifically designed for use in the corporate setting. As well as having good content, criterion and construct validity, the “richness” of the data generated can help health promotion specialists develop appropriate and targeted interventions for the respondent population. Information on areas such as nutritional choices, levels of habitual physical activity, sleep difficulties and stress symptoms provides data that can be directly used in ensuring the correct and most appropriate health interventions are delivered to the population being assessed. In addition the single question on work effectiveness can be used as an initial “screener” prior to more in-depth evaluations of productivity such as with the WHO-HPQ.

One would naturally expect those individuals who have taken more time off due to illness to have worse health status than those who have been absent for less time. We have demonstrated that sickness absence in the preceding 3 months is a significant predictor of HWB score and remains so when other

variables are controlled for. This is an indication that the HWB is “tapping” into health status issues that are critical to businesses as a whole. Further confirmation of the discriminant validity of the HWB is needed, however a suggestion that it can detect real differences in health status between groups is seen by the significantly better scores observed between those with more senior positions as compared with those in junior positions. This difference possibly reflects the better financial rewards, the better access to healthy alternatives and the superior levels of job control associated with more senior corporate positions.

The fact that the HWB score and sub-indices were significantly correlated with the broadly similar SF-36 multi-item scales is an indication that the majority of the constructs assessed by the SF-36 are at least partially reflected in the HWB.

Productivity whilst at work can be influenced by a multitude of different factors, however as demonstrated by Burton and colleagues health status is a major contributor[12]. Our study has confirmed this clear relationship between health status and productivity decrement, which remains significant even when other possible confounders are taken into account. Additionally we have demonstrated that there is an odds ratio of 3.62 of making the productivity standard for those with good health status as compared with those with poor health. This information can quite easily be used by corporations to model future productivity gains and to calculate a likely ROI for the institution of a health promotion program.

Although these initial results appear promising, data collection from a larger employee sample, from different sectors and incorporating a wider age range is necessary in order to confirm that our observations still hold true and then to normalise the scoring. Additionally, longitudinal data on whether the HWB can be used as a predictive tool for populations, and hence provide businesses with visibility on how their employee health status issues are likely to affect their bottom line, is the logical next step. This process is already underway in 4 multinational organisations with populations in both the USA and the UK and being overseen by the Institute for Health and Productivity Management (IHPM).

Conclusion:

In summary we present a new health status measure, the Health and Well-being Assessment (HWB), which has the following key features:

- (i) specifically designed for the corporate environment addressing the health and well-being issues that affect key business drivers
- (ii) quick and easy to use
- (iii) generated data is useful for guiding future interventions

By combining medical health issues with other more “lifestyle” and well-being focused areas within a short, easy to use questionnaire we believe that we have created a useful corporate tool.

Competing Interests

PM has a part-time salaried role with health and well-being business consultants Vielife.

No other financial competing interests

No non-financial competing interests.

Authors' contributions

PM performed all of the work that is contained within this paper.

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Table 1: Business Pertinent Health & Well-being Issues:

Following interviews with executives and managers the key issues for businesses could generally be classified in one of four main areas; for all four we found evidence for a modifying effect of health and well-being.

Business Issue	Impact of health and well-being status
Increasing the productivity of the workforce	<p>Many medical conditions and lifestyle factors (e.g. diabetes, cardiovascular disease, migraine, pain, respiratory disease, high BMI, smoking) have a direct impact upon day-to-day productivity of the workforce[12,14,19,22,32].</p> <p>Sleep disturbance impacts upon individual's performance during their working day[33].</p> <p>Psychological distress / stress can have a profound impact upon worker productivity and performance[21,34,35].</p>
Improving or maintaining customer service and satisfaction	<p>Physical and mental health are factors in developing employee commitment, job satisfaction and a "climate for service" within an organisation. Via these areas the health and well-being of employees is likely to be an indirect contributor to customer service and satisfaction[36-39].</p> <p>Employee attitude and job satisfaction</p>

	directly affect sales increases and customer satisfaction[36].
Reducing the cost of ill health	Corporate health and well-being programs have been shown to produce a return on investment by decreasing medical care costs, worker compensation costs and absenteeism[29,30,40-42].
Reducing potential business risks	<p>Improving physical fitness within the workforce can reduce voluntary staff turnover[43].</p> <p>Union backed employee stress-related liability claims have risen four-fold since 1999, posing a significant risk to the businesses[44].</p> <p>Early retirement due to illness is placing a significant burden upon pension plans[45].</p>

Table 2: α values for the multi-item variables of the HWB

Scale	Number of items	Cronbach α
Symptoms of stress	6	0.83
Sleep status	3	0.70
Nutritional balance	3	0.73

Table 3: Overall HWB score plus the 10 component sub-index scores for the 2224 questionnaire respondents.

	Mean Score	Median Score	Standard deviation	25 th centile	75 th centile
HWB score	61.4	62.1	13.7	52.1	71.0
Medical health	62.4	100	41.3	25.0	100
Pain	71.2	75.0	21.9	50.0	75.0
Physical activity	26.3	0	38.1	0	50.0
Nutrition	57.5	58.3	19.0	41.7	75.0
Sleep	62.3	66.7	23.8	50.0	83.3
Stress	55.7	58.3	18.2	41.7	70.8
Job satisfaction	59.0	75.0	30.2	50.0	75.0
Smoking status	77.5	100	41.8	100	100
Alcohol consumption	92.2	100	26.8	100	100
Body Mass Index Score	49.7	25.0	42.2	25.0	100

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Productivity Decrement (% working week)

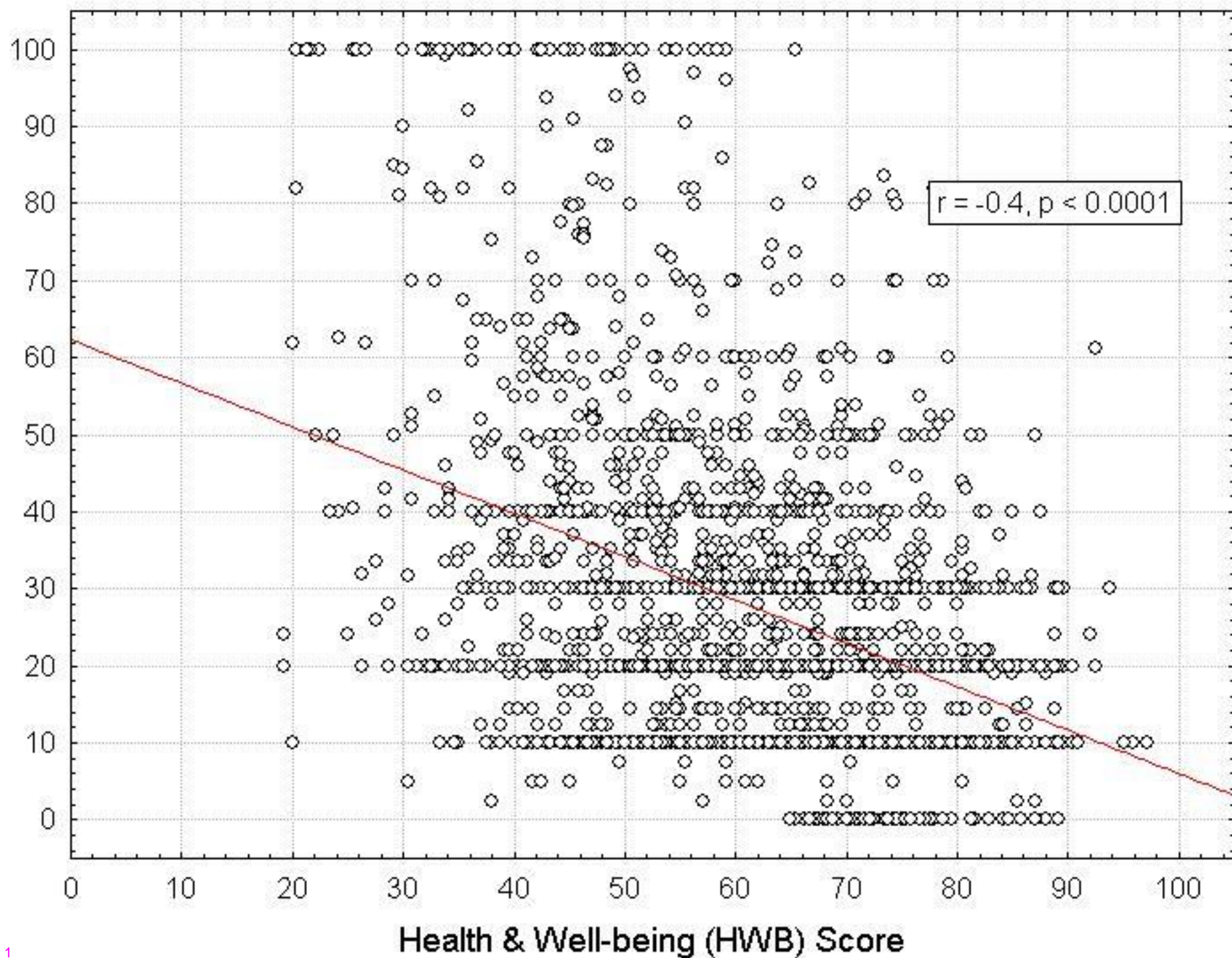


Figure 1

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