

# THE SUSTAINABLE TRAINING, TREATMENT, EMPLOYMENT PROGRAM MODEL: EFFECTS OF MANUAL THERAPY ON MUSCULOSKELETAL PAIN AND LIMITATION IN A FILIPINO SQUATTER COMMUNITY

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## ABSTRACT

**Objective:** The purpose of this study is to describe the musculoskeletal conditions and associated pain and limitation and the effects of massage treatment in a Filipino squatter community.

**Methods:** The study was conducted at the Hands On Philippines Education (HOPE) clinic in Bagong Barrio, Caloocan, Philippines. Baseline data were collected before the first treatment, and follow-up data were collected immediately after the second treatment. Treatment was delivered by massage students who were trained in massage by a chiropractic program faculty member through the Project HOPE charitable community-based initiative. A prospective pretest-posttest observational research design was used. The sample consisted of 290 subjects aged 16 years and older visiting the Project HOPE clinic. One hundred ninety-two subjects completed the follow-up surveys. The outcome measures were sites of pain, self-reported levels of pain, and limitation to activities of daily living at baseline and after the second massage therapy treatment.

**Results:** Three self-reported anatomical locations were identified by each subject. The most frequently reported painful sites over the last 7 days among the 166 respondents were the upper back (36.7%), lower back (18.7%), and shoulders (16.3%). The pre-post treatment analyses of pain and disability was restricted to 66 participants who provided completed outcome measures. After 2 massage therapy treatments, all pain and limitation scores decreased. A comparison of mean self-reported levels of pain and disability at baseline and immediately after the second consultation showed statistically significant decreases of pain ( $t_{65} = 16.97, P < .001$ ) and disability ( $t_{65} = 12.4, P < .001$ ).

**Conclusion:** This study suggests that participants who visited the Filipino squatter community clinic experience a high prevalence of musculoskeletal conditions located primarily within the axial skeleton, and that, in the short term, massage therapy delivered on-site by trained therapists was helpful in reducing self-reported levels of pain and limitation to activities of daily living. (*J Manipulative Physiol Ther* 2011;34:381-387)

**Key Indexing Terms:** *Musculoskeletal System; Pain; Massage; Chiropractic; Public Health*

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**M**usculoskeletal conditions are suspected to be prevalent and contribute to a substantial burden of illness in marginalized Filipino communities.<sup>1</sup> These conditions are thought to be complicated by the heavy, repetitive nature of the work carried out by this population<sup>1,2</sup>; yet, there is little published research on the prevalence or associated pain and disability because of musculoskeletal conditions in this population. A significant proportion of Filipino people live in poor urban communities, and the number of urban poor families is increasing. In 2000, the incidence of urban poverty in the Philippines was estimated at 20%, and the magnitude of urban poor families grew by nearly 11% nationwide between 1997 and 2000.<sup>3</sup> This poses a substantial public health concern.

In a study of 495 Filipino workers in 29 manufacturing industries, upper trunk and low back pain was experienced by 23.8% of workers.<sup>4</sup> Another study of 3065 adults living in an urban Filipino community reported that 16.3% of the adult population experienced a musculoskeletal condition.<sup>1</sup> Despite the limited number of studies examining musculoskeletal conditions in Filipino communities, there is some evidence to suggest a high burden of pain and disability associated with these conditions.<sup>1</sup> However, there are no published studies that describe the impact of massage therapy in managing these conditions. According to the World Health Organization, musculoskeletal conditions represent more than half of all chronic conditions<sup>5</sup> and are the most common cause of severe long-term pain and physical disability.<sup>6</sup> These conditions are a major burden on individuals, health systems, and welfare systems, with the associated indirect costs being predominant.<sup>7</sup>

Many poorer people in the Philippines rely on heavy, repetitive physical labor to earn a living. This includes farmers, factory workers, children, orphans, and the elderly. For the poor, there is very little opportunity to access affordable and suitable health care for pain relief, and public welfare is almost nonexistent. Thus, poor people learn to live with pain and disability and endure further financial and physical hardship because of their limited ability to work.<sup>3,8</sup>

The heavy burden of musculoskeletal illness experienced by poor people, coupled with their limited ability to access effective and affordable treatment, laid the foundations for Project Hands On Philippines Education (HOPE). This is a health program run by volunteers that aims to provide sustainable, community-based management of painful, disabling musculoskeletal conditions experienced by poor Filipino communities. Part of Project HOPE includes evaluating any changes to self-reported levels of pain and disability after massage therapy treatment as delivered by massage therapy students trained by HOPE. A massage course coupled with ongoing voluntary care provided by massage therapy students and graduates became the forerunner of Project HOPE. This history sets the context and framework for the Sustainable Training

Treatment Employment Program (STTEP).<sup>9</sup> The STTEP encompasses training and employment of health workers (HWs) and free or low-cost treatment for patients to alleviate pain and disability. The purpose of this study is to describe the musculoskeletal conditions and associated pain and limitation and the effects of massage treatment in a Filipino squatter community.

## METHODS

### Study Setting

Bagong Barrio comprises approximately 47 hectares and has an estimated population of 200 000; most are children. Between 1960 and the early 1970s, Bagong Barrio functioned primarily as the main rubbish dump for Manila. It was known as *Pugad Baboy* or the “Pig Pen” in Tagalog (the language spoken in Manila). This Barrio was the original “Smokey Mountain” well-known for its smouldering top. The “smoke” was generated from an assortment of decaying vegetable matter. Many of those who migrated to Manila from the provinces in the hope of finding work were left with few prospects for gainful employment. They survived by collecting, sorting, and recycling waste to provide the bare necessities for their families in Bagong Barrio.

The current situation in Bagong Barrio, although improved since the 1970s, continues to be an environment of hardship. Eighty percent of residents live below the poverty line, 25% still scavenge for a living, 48% are factory workers, and 14% are unemployed.<sup>8,10,11</sup> Heavy repetitive work is a well-documented risk factor for musculoskeletal conditions,<sup>12</sup> and the burden of illness imposed by these conditions is exacerbated by the extreme poverty and limited access to effective and affordable management of these conditions in marginalized communities.<sup>13</sup>

### Methods

This study was conducted between January 12, 2009, and November 22, 2009, in Bagong Barrio, Caloocan, Philippines. Baseline data were collected before the first treatment and immediately after the second treatment and aimed to identify the types of musculoskeletal conditions, associated levels of pain (at different anatomical sites), limitations to daily activity, and response to massage therapy for reported levels of pain and impairment.

After discussions with a cross section of community members, a community advisory group was formed, which included representatives from Bagong Barrio, experienced HWs, and the charity Hands On Health Australia (<http://handsonhealth.com.au/>). The community advisory group aimed to collaboratively ensure that the study was sensitive and responsive to the needs of the community and was carried out in a culturally appropriate manner.

A pre-post test observational research design was used. The sample comprised 290 subjects presenting to the Bagong Barrio HOPE clinic between January 12, 2009, and November 22, 2009. Participating community members completed a consent form that explained the purpose of the survey. Ethics approval for this study was obtained from the Human Research Ethics Committee of the University of Wales through McTimoney College of Chiropractic.

For this study, we used an instrument that had been prevalidated in a prior study of an Australian indigenous community.<sup>14</sup> In that prior study, the instrument was administered by HWs, whereas in this current study, massage therapy students administered the instrument. The purpose of the screening survey was to identify participants who had experienced a musculoskeletal condition including ache, pain, or discomfort. The survey was previously shown to have acceptable sensitivity and specificity for measuring levels of pain and disability against clinical examination.<sup>14,15</sup>

### Participants

This study was conducted in a local community setting using members of the community who chose to attend the Project HOPE charitable massage therapy clinic. Two hundred ninety subjects were selected using a convenience sample from those visiting the Bagong Barrio HOPE clinic.

### Intervention

Students were trained through a massage course developed by a volunteer chiropractor who was also a clinical educator from the Discipline of Chiropractic at RMIT University, Australia. This course trained massage therapists in Bagong Barrio to care for their own community as well as find gainful employment. More than half of these are currently employed in programs throughout the Philippines and other countries. Many continue to voluntarily serve the needs of the poor within their communities via charitable Hands on Health Programs.

The subjects were examined by massage therapy students and subsequently received massage therapy treatment as taught in the program delivered by the Murray College of Health Education and under the guidance of trainers. Massage students volunteering in this program provided the massage treatment. Two treatments were delivered to each subject.

### Measures

The outcome measures were

1. self-reported painful anatomical sites in the last 7 days;
2. self-reported levels of pain in the last 7 days on a Likert scale ranging from 0 to 10; self-reported levels

of limitation to activities of daily living (ADLs) in the last 7 days on a Likert scale ranging from 0 to 10;

3. self-reported musculoskeletal risk factors including injury or accident as a cause of the main condition, history of a similar condition, chronicity of the main condition (defined as  $\geq 7$  weeks); and
4. Pre- and posttreatment responses using Likert scales ranging from 0 to 10.

The survey forms were administered by massage therapy students who underwent an orientation session to familiarize themselves with administering the surveys. The massage therapy students administering the surveys did not themselves provide treatment so as to remain impartial in terms of influencing subject-reported treatment outcomes.

### Statistics

Data were entered on the survey forms and then transferred to Statistical Package for the Social Sciences version 17 (Chicago, IL).

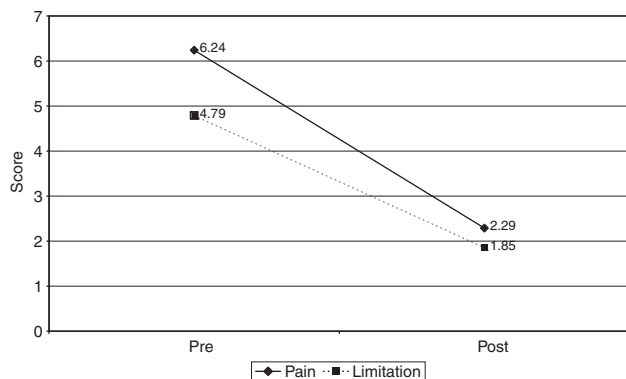
Frequencies were used to describe the prevalence of painful anatomical sites over the previous 7 days. Paired *t* tests were used for assessing change associated with the massage treatment between reported levels of pain and functional limitation before treatment and immediately after the second treatment. Statistical significance was set at  $P < .05$ .

## RESULTS

Although all 290 subjects provided consent to participate after the first treatment, there was a 34% loss to follow-up after the first treatment, leaving 192 people who completed the outcome measures after the second massage therapy treatment. The loss to follow-up was thought to be due to the challenging and unpredictable nature of people's lives in the squatter community. Of the 192 participants who completed 2 treatments and the survey instruments, 26 of the surveys were found to be incomplete and were therefore not included in the analysis. Furthermore, many of the survey instruments were incomplete with respect to pain and ADL scores either for pre- or posttreatment surveys. Therefore, for the pre-post treatment analyses of pain and disability, sample size was restricted to 66. Age, sex, and occupation were not recorded in this study.

The most frequently reported painful sites over the last 7 days among the 166 respondents were the upper back (36.7%), lower back (18.7%), and shoulders (16.3%). The least reported sites were hips/thighs (3.0%), wrists (1.2%), and the elbows (0.6%). Half of the participants surveyed reported having musculoskeletal pain in more than 5 anatomical sites.

Self-reported levels of pain and limitation in function were reported on a Likert scale, where 0 indicated no pain



**Fig 1.** Self-reported levels of pain (unbroken line) and limitation in function (dotted line) before and after treatment.

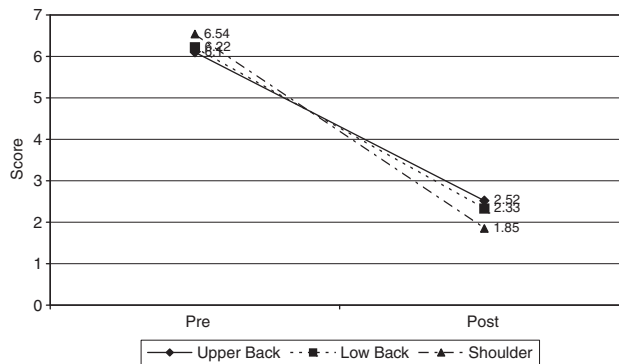
and 10 recorded worst pain (Fig 1). Before treatment, mean scores of pain and limitation were more than 6 and 4, respectively. After 2 massage therapy treatments, all pain and limitation scores decreased. A comparison of mean self-reported levels of pain and disability at baseline and immediately after the second consultation showed statistically significant decreases of pain ( $t_{65} = 16.97, P < .001$ ) and disability ( $t_{65} = 12.4, P < .001$ ).

Subjects who described high levels of pain pretreatment of the 3 most commonly reported conditions including upper back, low back, and shoulder regions reported lower levels of pain posttreatment (Fig 2). Self-reported pain scores were recorded on a Likert scale, where 0 was “no pain” and 10, “worst pain.” Before treatment, mean pain scores for the most prevalent conditions were more than 6 (shoulders [ $\bar{x} = 6.54$ ], upper back [ $\bar{x} = 6.10$ ], and lower back [ $\bar{x} = 6.22$ ]). After the second massage therapy treatment, however, all pain scores showed statistically significant decreases (shoulders:  $t_{12} = 10.57, P < .001$ ; upper back:  $t_{20} = 11.41, P < .001$ ; lower back:  $t_8 = 6.36, P < .001$ ).

In relation to the duration of the presenting complaint, 62.1% of respondents ( $n = 169$ ) reported that pain had been present for less than 7 weeks, whereas 37.9% of participants reported it to be present for longer than 7 weeks. This finding suggests that, for one third of respondents, the presenting condition was subacute and bordering on chronic pain.

Most respondents (86%, or  $n = 171$ ) did not attribute their main pain in the last 7 days to a specific injury or accident compared with just 14% reporting that their presenting pain was related to a specific injury or accident. A total of 61.9% of subjects ( $n = 168$ ) reported previously experiencing their main condition compared with 38.1% who had no history of a similar complaint.

Having showed an overall significant reduction in pain and limitation, it was decided to further explore pain and limitation scores of those subjects who recorded a 3- to 5-point reduction in pain and a reduction in limitation score of



**Fig 2.** Subjects who described high levels of pain pretreatment of the 3 most commonly reported conditions including the upper back (unbroken line), lower back (dotted line), and shoulder regions (broken line); reported lower levels of pain posttreatment.

2 to 4 points on a 10-point scale. This analysis also examined which anatomical sites were associated with these levels of improvement.

Of the 9 participants who reported a pain reduction of 5 points, 6 indicated that this reduction was for the shoulders or upper or lower back. Of the 20 who reported a reduction in pain of 4 points, 15 (75%) indicated the site was the shoulder, or upper or lower back. Similarly, 9 (75%) of the 12 who reported a reduction in pain of 3 points claimed that the pain site was the shoulders or upper or lower back. Showed reductions in pain associated with treatment mainly occurred in the shoulders or upper or lower back, which included 30 (73%) of the 41 participants who indicated a reduction of pain between 3 and 5 points on the 10-point scale.

A reduction in limitation of ADLs between 2 and 4 points associated with massage treatment was seen in 40 respondents, with 28 (70%) reporting improvements in the shoulders and upper or lower back. For a reduction of limitation of 4, 6 (67%) of the 9 participants reported improvements in the shoulders or upper back. Similar anatomical areas of involvement were reported for those subjects who experienced a reduction in limitation of ADLs of 3 (53%) and 2 (57%).

## DISCUSSION

### Prevalence of Musculoskeletal Conditions

The results suggest that, for the people who attended this community clinic, there is a particularly high prevalence of musculoskeletal conditions involving the trunk, even more so than levels reported in other Filipino studies.<sup>1,4</sup> Of note was that up to 50% of participants experienced an average of 5 musculoskeletal conditions. It has been reported that those experiencing pain at multiple sites are predisposed to long-term impairment.<sup>16-18</sup>



Most people who visited this community clinic endured moderate levels of self-reported pain. The pain interfered with participants' ADLs to a lesser degree (Figs 1 and 2). These findings, of relatively low levels of limitation compared with reported levels of pain, are consistent with the outcomes of similar studies.<sup>19-21</sup> However, musculoskeletal pain can impede ADLs such as paid work or work in-kind. Musculoskeletal pain may also compromise an individual's health by limiting their participation in health promoting activities such as aerobic exercise and recreational activities.

This project has shown that, for people who attended the community clinic, musculoskeletal conditions involving the trunk are highly prevalent. Evidence from other studies suggests that apart from musculoskeletal conditions being the most common cause of severe long-term pain and physical disability, such conditions also significantly affect the psychosocial status of affected people as well as their families and careers, further diminishing quality of life. The situation is worsened in developing countries where health and welfare systems are almost nonexistent especially among the poorest of the poor.<sup>13</sup>

Poverty and ill health are intertwined. Poor countries tend to have worse health outcomes than better-off countries. Within countries, poor people have worse health outcomes than better-off people.<sup>13</sup> Millennium Development Goals were created to address basic human needs and state that 1 of the targets is to end human poverty.<sup>22</sup> Through the reduction of poverty, improved education, and improvement of health, those in most need will be able to develop.<sup>22</sup> Chiropractic programs are becoming more aware of these needs, and several studies have addressed these issues in various countries.<sup>23,24</sup> Project HOPE attempts to address health inequalities in respect to benign musculoskeletal pain in several ways: firstly, through the direct provision of culturally sensitive, accessible, affordable, and skilled hands-on treatment that positively impacts on pain and disability levels. Secondly, By decreasing patients' pain levels, people are better able to carry out ADLs including the work required to financially sustain their families. Thirdly, the STTEP enhances employment opportunities for HOPE graduates to improve their standard of living. Employment opportunities are supported by the trend toward corporate social responsibility growth of the global spa industry that may provide employment opportunities for massage therapists delivering massage services.<sup>25</sup> This is anticipated to further assist in breaking the cycle of poverty in poor communities by providing opportunities to acquire necessary hands-on skills and, subsequently, employment as evidenced by a readiness of the burgeoning Filipino spa industry to employ HOPE graduates.

Beyond the ongoing need to provide accessible, affordable, and culturally appropriate services to manage musculoskeletal pain and other highly prevalent conditions is the task of raising awareness of how to best sustain the

management of musculoskeletal conditions in marginalized Filipino communities. Future interventions should also be informed by the prevalence of modifiable risk factors as a step toward preventing the substantial burden of illness imposed by musculoskeletal conditions in this and other communities. An understanding of these modifiable risk factors would inform tailored health promotion initiatives with potential to improve health outcomes.<sup>26</sup> There is a current trend for the chiropractic community to recognize the social responsibility to address public health needs of underprivileged populations and consider the determinants of health when creating programs to address these needs.<sup>27-29</sup> Programs such as Project HOPE help to address these needs.

### Limitations

The use of a nonexperimental, observational study design has well-established limitations. First, it is not possible to attribute any change to the intervention itself, as other confounding effects (notably, natural history and regression to the mean) could be responsible for the change observed. However, the long-term nature of much of the pain and disability reduces the likelihood that these confounding effects are the sole explanation for the beneficial results. Second, the measurement of change was not measured long term and may have been insufficient to show the full benefits of therapy as usually delivered in a practice setting. Therefore, longer term follow-up may provide more accurate outcomes. Finally, the services provided to subjects attending the Project HOPE clinic are free or low cost; therefore, there is a potential for response bias to influence the participants' replies to please or accommodate the perceived needs or expectations of the Project HOPE team. We minimized this problem by separating questionnaire administration from treatment.

### Future Studies

The objective of Project HOPE is to provide sustainable training, treatment, and employment through the delivery of massage therapy to the poor of the Filipino squatter communities who both experience a significant burden of musculoskeletal pain and disability and who are unable to access adequate health care. The project HOPE intervention is therefore a complex one, and there is increasing acceptance of the necessity of evaluating such complex interventions in a stepwise fashion—starting with exploratory descriptive and pilot work.<sup>30,31</sup> This study, in which we surveyed the degree and type of musculoskeletal pain and disability as well as beginning to pilot survey and outcome measures, is a vital first step to future experimental designs. We were able to build on our previous experience of developing survey and outcome tools in Australian aboriginal communities with low literacy rates<sup>15</sup> and investigate whether these tools were culturally

appropriate in this deprived Filipino community. In addition, nonexperimental research designs have advantages in service evaluations because they minimize the disruption to the provision of the service that is being provided.

Local HWs have an in-depth understanding of their communities' health needs, so they are ideally placed to provide cost-effective and culturally appropriate health promotion interventions of this kind.<sup>32,33</sup> As the massage therapists conducting the massage therapy program including its evaluation were residents of Bagong Barrio, they could personally reassure and encourage the community to use the services provided at the HOPE clinic.

Given the disadvantage of marginalized Filipino communities and their high musculoskeletal burden of illness, there is an urgent need to adequately resource initiatives that will provide long-term, culturally sensitive health care solutions to improve their health-related quality of life. The prevalence of these conditions in marginalized rural and remote communities, however, remains largely unknown and a valuable topic for future study. Future studies in marginalized Filipino communities would also benefit by measuring other health-related quality of life changes and provide additional health care services that may be associated with the program.

## CONCLUSION

This study showed that participants in this study who visited the Filipino squatter community clinic experience a high prevalence of musculoskeletal conditions located primarily within the axial skeleton and that, in the short term, massage therapy delivered on-site by trained therapists was helpful in reducing self-reported levels of pain and limitation to ADLs.

### Practical Applications

- The typical profile of a person presenting for treatment in this squatter community is a person with at least 3 musculoskeletal conditions that have a tendency not to be the result of injury or accident that has been present for less than 7 weeks.
- The highest proportion of subjects (37.6%) in this study reported pain in the upper back area.
- There was a statistically significant improvement in self-reported pain and limitation to ADLs because of massage therapy pre- to posttreatment.

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No funding sources or conflicts of interest were reported for this study.

## REFERENCES

1. Dans L, Tankeh-Torres S, Amante C, Pensergera E. The prevalence of rheumatic diseases in a Filipino urban population: a WHO-ILAR COPCORD Study. World Health Organization. International League of Associations for Rheumatology. Community Oriented Programme for the Control of the Rheumatic Diseases. *J Rheumatol* 1997;24:1814-9.
2. Lecerf J, Reitz C, Chasteigner A. Evaluation of discomfort and complications in a population of 18102 overweight or obese patients. *Presse Med* 2003;32:689-95.
3. [www.adb.org/Documents/Books/Poverty.../executive-summary.pdf](http://www.adb.org/Documents/Books/Poverty.../executive-summary.pdf). Poverty in the Philippines: income, assets, and access. Created 2005. Accessed 2010.
4. Del Prado-Lu J. Risk factors to musculoskeletal disorders and anthropometric measurements of Filipino manufacturing workers. *Int J Occup Saf Ergon* 2004;10:349-59.
5. Dieppe P. Osteoarthritis. *Acta Orthop Scand Suppl* 1998;281:2-5.
6. Murray J, Lopez A, editors. The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries and risk factors in 1990 and projected to 2020. Cambridge (Mass): Harvard University Press; 1996.
7. Wagstaff A. Bulletin of the World Health Organization. WHO; 2003, Geneva. Geneva.
8. Ellen E. Interview with Dein Vindigni on "the history of Bagong Barrio". Interview in Bagong Barrio, Caloocan City, Manila, 2005; 2009.
9. Vindigni D, Polus B, Edgecombe G, Howard M, van Rotterdam J, Redpath F, et al. The STTEP: a model for musculoskeletal health care in marginalized communities. *J Altern Complement Med* 2009;15:885-90.
10. Doromal R, Gutierrez AI. Bagong Barrio: in its continuing pilgrimage. Quezon City, Philippines: Kalayaan Press; Claretian Publications; 1988.
11. Hemingway M. Available from: <http://www.aworldconnected.org/article.php/548.html>. Dispatches from the Philippines: poverty and entrepreneurship. Philippines People and culture, 2004. Created 2004. Accessed May 2004.
12. Woolf A, Akesson K. Understanding the burden of musculoskeletal conditions. The burden is huge and not reflected in national health priorities. *Br Med J* 2001;322:1079-80.
13. Wagstaff A. Bulletin of the World Health Organization. WHO; 2002, Geneva. Geneva.
14. Vindigni D, Griffen D, Perkins J, Da Costa C, Parkinson L. The prevalence of musculoskeletal conditions, associated pain and disability and the barrier to managing these conditions in a rural, Australian aboriginal community. *Rural Remote Health* 2004;4:230.
15. Vindigni D, Parkinson L, Rivett D, Da Costa C, Perkins J, Blunden F, et al. Developing a musculo-skeletal screening survey for indigenous australinas living in rural communities. *J Rural Remote Health* 2006;321.
16. Frymoyer J. Back pain and sciatica. *N Engl J Med* 1988;318:291.
17. Adams M, Mannion A, Dolan P. Personal risk factors for first-time low back pain. *Spine* 1999;24:2497-505.
18. Harkness E, Macfarlane G, Nahit E, Silman A, McBeth J. Risk factors for new-onset low back pain amongst cohorts of newly employed workers. *Rheumatology* 2003;42:959-68.

19. Darmawan J, Valkenburg H, Muirden K. The prevalence of soft tissue rheumatism. A who-ilar Copcord study. *Rheumatol Int* 1995;15:121-4.
20. Farooqi A, Gibson T. Prevalence of the major rheumatic disorders in the adult population of North Pakistan. *Br J Rheumatol* 1998;37:491-5.
21. Sprangers M, deRegt E, Andries F. Which chronic conditions are associated with a better or a poorer quality of life? *Clin Epidemiol* 2000;53:895-907.
22. Johnson C. Poverty and human development: contributions from and callings to the chiropractic profession. *J Manipulative Physiol Ther* 2007;30:551-6.
23. Garner MJ, Aker P, Balon J, Birmingham M, Moher D, Keenan D, Manga P. Chiropractic care of musculoskeletal disorders in a unique population within Canadian community health centers. *J Manipulative Physiol Ther* 2007;30:165-70.
24. Stevens GL. Demographic and referral analysis of a free chiropractic clinic servicing ethnic minorities in the Buffalo, NY area. *J Manipulative Physiol Ther* 2007;30:573-7.
25. Cohen M, Bodeker G, editors. *Understanding the global spa industry*. Oxford: Butterworth Heinemann; 2008.
26. Vindigni D, Walker BF, Jamison JR, Da Costa C, Parkinson L, Blunden S. Low back pain risk factors in a large rural Australian Aboriginal community. An opportunity for managing comorbidities? *Chiropr Osteopathy* 2005;13: 1746-340-13.
27. Green BN, Johnson C. Chiropractic and social justice: a view from the perspective of Beauchamp's principles. *J Manipulative Physiol Ther* 2010;33:407-11.
28. Johnson C, Baird R, Dougherty PE, Globe G, Green BN, Haneline M, et al. Chiropractic and public health: current state and future vision. *J Manipulative Physiol Ther* 2008;31: 397-410.
29. Johnson C, Green BN. Public health, wellness, prevention, and health promotion: considering the role of chiropractic and determinants of health. *J Manipulative Physiol Ther* 2009;32: 405-12.
30. Campbell N, Murray E, Darbyshire J, Emery J, Farmer A, Griffiths F. Designing and evaluating complex interventions to improve health care. *Br Med J* 2007;334:455-9.
31. Craig P, Dieppe P, MacIntyre S, Mitchie S, Nazareth I, Petticrew M. Developing and evaluating complex interventions: the new Medical Research Council guidance. *Br Med J* 2008;337.
32. Saggars S, Gray D. *Aboriginal health and society: the traditional and contemporary aboriginal struggle for better health*. Sydney: Allen and Unwin; 1991.
33. Pacza T, Steele L, Tennant M. Dental train-the-trainer program for aboriginal health workers in the Kimberley region. Nedlands: School of Oral Health Sciences TUoWA; 2000.