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Distortion product otoacoustic emissions as a health surveillance technique for hearing screening in workers in the steel manufacturing industry

The compelling case for supporting pregnancy and breastfeeding in the workplace

Safety and health in mining: Part 3

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Michelle Perry, Tel: +27 (0)31 764 0593
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The South African Society of Occupational Health Nursing Practitioners (SASOHN)
Belinda Walters-Girout, Tel: +27 (0)861 SASOHN (727646),
Fax: +27 (0)86 263 8757
e-mail: office@sasohn.co.za, www.sasohn.co.za

The South African Society of Occupational Medicine (SASOM)
Jenny Acutt, Tel: +27 (0)12 803 7418,
Fax: +27 (0)11 507 5085
e-mail: info@sasom.org, www.sasom.org

The Southern African Institute for Occupational Hygiene (SAIOH)
Kate Smart, Tel: +27 (0)71 672 4916,
Fax: +27 (0)86 631 6117,
e-mail: info@saioh.co.za, www.saioh.co.za

The Mine Medical Professionals' Association (MMPA)
Karen van Zyl, Tel: +27 (0)11 568 2051
e-mail: karenvz@mpas.org.za, www.mmpasa.org/wp

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From the Editor . . .

Gill Nelson,
Editor-in-Chief

Occupational Health Southern Africa is moving towards having more scientific content, and you will have noticed the abundance of research papers in our previous issue. Nevertheless, rest assured that we have no intention to stop publishing reports, and other news and announcements that are relevant to occupational health. In this issue, we have two workshop reports: one on the Gender, Health and World of Work Programme, and the other on a Construction and Health workshop, both facilitated by the National Institute for Occupational Health (NIOH). Jim teWaterNaudé has written a review on a book about asbestos mining, by Piet van Zyl.

The scientific content in this issue includes an original research paper on distortion product otoacoustic emissions by Meshack Moepeng and his colleagues at the University of Pretoria. Noise-induced hearing loss (NIHL) remains on the health agendas of the Departments of Health, Labour and Mineral Resources. There is much work still to be done before we see a reduction in NIHL rates in the industries at risk, such as mining. The problem is not restricted to South Africa; the National Institute for Occupational Safety and Health (NIOSH) estimates that there are 10 million people in the US with NIHL (see https://www.cdc.gov/niosh/topics/noise/stats.html for more). Penny Reimers, from the University of KwaZulu-Natal has written an informative paper on breastfeeding in the workplace, with many recommendations for assisting working women, both prior to and after giving birth. You will also be able to read the third and final part in the series on safety and health in mining by Kaj Elgstrand et al., which concentrates on informal mining, including its effects on communities, and the roles of women and children in unregulated mining activities.

An exciting development for both those of us behind the scenes and our potential authors, is the introduction of Scholastica. This is an electronic platform that will assist us to streamline the submissions and peer review processes at *Occupational Health Southern Africa*. I am aware that many of you are frustrated by the long delays from submission to publication, which we hope will be substantially reduced with our move to Scholastica. Scholastica Peer Review is a central online editorial management platform, used by a host of academic journals from a wide variety of disciplines, and promises to automate and track the peer review process, streamlining communications between authors, editors and reviewers. For example, automated messages will notify authors about the status of their manuscripts with regard to the peer review process, and all communications pertaining to a manuscript will be accessible. The editors will be able to identify bottlenecks in the peer review process, facilitating easier and quicker management of manuscripts.

Scholastica Peer Review online editorial management system

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Scholastica will be linked to our website shortly.

Finally, please remember that all papers are freely available (open access) on the website six months after publishing. On behalf of the editorial and publishing teams, I wish all of you who are writing exams the best of luck.

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Upcoming events

LOCAL EVENTS

DATE	MEETING	PLACE	MORE INFORMATION
19 Oct 2017	SASOHN WC Workshop – Psychiatry in the Workplace	CPUT, Cape Town, Western Cape	E-mail: TBosman@consol.co.za Website: www.sasohn.co.za
25-27 Oct 2017	SAIOH Annual Conference and AGM	Misty Hills Country Hotel, Conference Centre and Spa, Muldersdrift, Gauteng	E-mail: info@saioh.co.za Website: www.saioh.co.za
1-3 Nov 2017	SASOHN Annual Conference & AGM: Pure Joy – Pure Jozi	Sandton, Johannesburg Gauteng	E-mail: office@sasohn.co.za Website: www.sasohn.co.za
13-14 Nov 2017	MMPA 20th Annual Congress	Bon Riviera on Vaal Hotel, Vereeniging, Gauteng	E-mail: karenvz@mpas.org.za
20-24 Nov 2017	NIOH Workplace: Biorisk Management Training Course	Sunnyside Hotel, Parktown, Gauteng	E-mail: shanaz.hampson@nioh.nhls.ac.za
25 Nov 2017	SASOM Annual Conference and AGM	Coastlands Hotel and Convention Centre, Umhlanga, KwaZulu-Natal	E-mail: info@sasom.org Website: www.sasom.org
12-15 Mar 2018	6th Global Congress for Qualitative Health Research	Sun City, North West province	E-mail: delight@eoafrica.co.za; www.eoafrica.co.za Website: www.qhrcongress.co.za

HEALTH AWARENESS DAYS, WEEKS AND MONTHS

SEPTEMBER

Cervical Cancer Awareness Month
Eye Care Awareness Month
National Heart Awareness Month

2-6	Back Week
19-25	World Retina Week
26	World Retina Day
26	World Environmental Health Day
29	World Heart Day

OCTOBER

Breast Cancer Awareness Month
Mental Health Awareness Month

9-15	National Nutrition Week
10	World Mental Health Day
10	World Hospice and Palliative Care Day
12	World Sight Day
12	World Arthritis Day
12-20	World Bone and Joint Week
15-19	World Obesity Week
17	International Day for the Eradication of Poverty
29	World Stroke Day
30	Commemoration of African Food and Nutrition Security Day

Upcoming events

INTERNATIONAL EVENTS

DATE	PLACE	MEETING	MORE INFORMATION
1-4 Oct 2017	Naples, Italy	10th International Symposium on Biological Monitoring in Occupational and Environmental Health (ISBM – 10)	E-mail: info@centercongressi.com Website: www.centercongressi.com/isbm2017
11-13 Oct 2017	Antigua Guatemala, Guatemala	XV Latin American Congress of Occupational Health – ALSO – 2017	E-mail: info@asomet.org Website: www.congreso.alsoweb.net
26-28 Oct 2017	Zagreb, Croatia	Education in OSH, emerging trends and unmet needs	E-mail: www.icoh-scetoh2017.org/ Website: www.icoh-scetoh2017.org/
9-11 Nov 2017	Valencia, Spain	3rd World Congress on Nursing and Healthcare	E-mail: nursing.conference@scientificfederation.com Website: scientificfederation.com/nursing-2017/index.php
20-24 Nov 2017	Ibadan, Nigeria	5th Annual Conference on Environmental Health Sciences	E-mail: cehsibadan@gmail.com Website: www.ehsanonline.org/cehs
28-30 Nov 2017	Khon Kaen, Thailand	10th International Joint Conference on Occupational Health for Healthcare Workers – Health & wellbeing in the health care sector	E-mail: naesinee@kku.ac.th; cnaesi@gmail.com Website: www.ohhcw2017.org
7-9 Mar 2018	Cape Town, South Africa	17th World Conference on Tobacco or Health – Uniting the World for a Tobacco-Free Generation	E-mail: secretariat@wctoh.org Website: http://wctoh.org/
29 Apr-4 May 2018	Dublin, Ireland	32nd International Congress on Occupational Health – ICOH 2018	E-mail: icoh2018@conferencepartners.ie Website: http://icoh2018.org/wp/
29-31 May 2018	Bari, Italy	DUST2018 – 3rd International Conference on Atmospheric Dust	E-mail: tesoreria@aipea.it Website: www.dust2018.org/

Distortion product otoacoustic emissions as a health surveillance technique for hearing screening in workers in the steel manufacturing industry

M Moepeng, M Soer, B Vinck

Department of Speech-Language Pathology and Audiology, University of Pretoria, Pretoria, 0002, South Africa

Correspondence: Meshack Moepeng, PO Box V6, Ramotswa, Botswana. e-mail: mmoepeng2001@yahoo.co.uk

ABSTRACT

Background: **Distortion product otoacoustic emissions (DPOAEs) are a promising screening technique for the early detection of subtle noise-induced cochlear function changes.**

Objectives: **To determine the applicability of DPOAEs as a health surveillance technique for the early detection of noise-induced hearing loss (NIHL) in workers at a steel manufacturing industry.**

Methods: **DPOAE measurements were recorded in 20 participants with no history of occupational noise exposure and 20 participants exposed to noise in the steel manufacturing industry. Participants were not exposed to noise for at least 48 hours prior to testing. All participants were male, with normal audiometric thresholds of ≤15 dB HL. The DPOAE presence and response levels for different frequencies were compared between the two groups. The study further evaluated the short-term test-retest repeatability of DPOAE measurements.**

Results: **The noise-exposed group had significantly lower DPOAE response amplitudes than the control group for all the tested frequencies: $p<0.001$ at 2002 to 4004 Hz; $p=0.01$ and $p=0.001$ at 6348 and 7996 Hz, respectively, suggesting early outer hair cell damage in the noise-exposed group. DPOAEs showed good reproducibility.**

Conclusion: **DPOAEs appear to be a sensitive technique for detecting noise-induced subtle cochlear function changes. DPOAEs could be used as a health surveillance technique in conjunction with pure tone audiometry for the early detection of NIHL in the steel manufacturing industry.**

Keywords: **Occupational noise exposure, occupational noise-induced hearing loss, cochlear function changes, cochlear damage, outer hair cells**

INTRODUCTION

Noise-induced hearing loss (NIHL) can affect workers negatively on emotional, social and financial levels, with adverse effects on their quality of life. The cost of NIHL compensation could also economically harm the affected organisations.[1] In order to prevent NIHL, it is important to detect noise-induced cochlear function changes as early as possible.[2]

Pure tone audiometry (PTA) is currently the gold standard test used in detecting and monitoring NIHL in different industries, including steel manufacturing factories where the daily noise exposure rate levels are in excess of 85 dB (A).[1,3] Existing NIHL can be easily measured and detected using PTA. However, in detecting subclinical noise-induced cochlear function changes, the sensitivity of PTA is questioned.[1,4,5] PTA measures the integrity of the whole auditory pathway, while NIHL in its early stages starts affecting, primarily, the outer hair cells in the cochlea.[1,6] There are some notable limitations in using PTA as the only hearing screening technique in occupational health surveillance programmes. Hearing damage is only detected when permanent irreversible damage has already occurred; consequently, there is no timely prevention of outer hair cell damage from occupational noise exposure.[3,7] Moreover, PTA testing is subjective and requires the cooperation of the employee. Therefore, results obtained from uncooperative individuals, who could be presenting with pseudohypacusis for compensation purposes, may be unreliable.[3] It is necessary to have a more sensitive test that can detect cochlear function changes at an early stage before permanent, irreversible noise-induced hearing damage occurs.

Several studies have indicated that otoacoustic emissions (OAEs) could be a more suitable diagnostic tool for the early detection of cochlear function changes from excessive noise exposure, allowing detection of cochlear damage before it is evident through conventional audiometry.[1,8,9] OAEs are low level sounds emitted by the outer hair cells in the cochlea and recorded in the external ear.[10] They are a by-product of outer hair cell electromotility (the cellular basis behind the cochlear amplifier), an active, nonlinear cochlear process largely responsible for producing normal hearing sensitivity and frequency selectivity.[11] OAEs can be used specifically to assess outer hair cell function, and have been found to be very sensitive in showing adverse effects of noise damage on outer hair cells.[8,12] They might

be a promising hearing screening technique for the early detection of NIHL in industrial hearing conservation programmes. Researchers are therefore increasingly proposing the incorporation of OAEs as part of occupational health surveillance hearing screening procedures.[2,3,13]

The two most common clinically used OAEs are transient evoked OAEs (TEOAEs) and distortion product OAEs (DPOAEs).[11,14,15] Both have previously been used to monitor the effects of noise.[8,12,16] DPOAE responses are frequency-specific, reliable, replicable and perform better in high frequencies, and therefore might be suitable for the early detection of NIHL which mostly affects the high frequencies.[5,13] The greatest affected frequency is usually 4 kHz, and at early stages of NIHL the affected frequencies are 3 kHz and above while the lower frequencies usually remain intact.[1] To date, there has been little research on the applicability of DPOAEs as a health surveillance technique in the early detection of noise-induced subtle cochlear function changes amongst workers in the steel manufacturing industry.

The main aim of this study was to determine the applicability of DPOAEs as a health surveillance technique for the early detection of NIHL in subjects working in a steel manufacturing industry. The specific objectives of this study were to evaluate the DPOAE response amplitude levels and to determine the proportion of present DPOAEs in workers in the steel manufacturing industry who are exposed to noise but present with normal audiometric thresholds. The study also assessed the repeatability of DPOAE measurements using a single probe fit paradigm.

METHODS

Participants

The study was conducted from March to April 2015, using a cross-sectional study design, in a district hospital in Botswana. Healthy male adults who had normal hearing thresholds (≤15 dB HL at all PTA-tested frequencies), normal outer ears, and normal middle ear function; were free from all signs and symptoms of ear disease; and were aged 18 to 55 years, were included in the study. Potential participants were excluded if they had a history of exposure to ototoxic agents, ear infections/discharges, ear surgery, hearing loss, chronic tinnitus, diabetes mellitus, hypertension, tuberculosis, malaria, or history of non-occupational noise exposure.

The noise-exposed group consisted of steel manufacturing factory workers exposed to various types of noise from machines for drilling, grinding, and welding steel fencing material. The general noise exposure levels within this industry are reported to be 85 to 98 dB (A).[17,18] The control group was recruited from the medical staff of a district hospital, with no history of occupational noise exposure.

A structured health assessment questionnaire was completed to rule out any medical or otological conditions that might have affected the auditory system and consequently influenced the DPOAE measurements.[19,20] The questionnaire, which consisted of both open and closed questions, was administered by the researcher (MM) who spoke the same language as the participants.

Procedures

The noise-exposed group participants stayed away from work for at least 48 hours prior to testing to exclude the effects of temporary threshold shift.[21] An otoscopic examination was performed for each participant prior to the PTA and DPOAE measurements to rule out any outer/middle ear pathology. Occluding wax was removed before the tests were performed.

Immittance testing

A Grason-Stadler GSI-38 clinical immittance meter (calibrated 26/11/2014) was used to perform Y-226 Hz tympanometry and obtain ipsi-lateral acoustic reflexes at 0.5, 1, and 2 kHz. Participants with normal tympanograms (Type A; middle ear compliance of 0.3 to 1.5 ml, ear canal volume of 0.6 to 2 ml, and a middle ear pressure of -50 to +50 daPa [22]) and normal acoustic reflex thresholds of 80 to 100 dB HL in both ears proceeded to audiometry.

Pure tone audiometry

Air conduction PTA was performed using a Grason-Stadler GSI 61 (2-channel) clinical audiometer and TDH-50 headphones. The hearing thresholds were measured at 0.25, 0.5, 1, 2, 3, 4, 6 and 8 kHz in each ear, following the British Society of Audiology's recommended procedure for pure tone audiometry.[23] The audiometric tests for both groups were performed in a double-walled soundproof booth in a hospital. Participants with normal hearing thresholds (≤ 15 dB HL) in both ears proceeded to DPOAE testing.

DPOAE measurements

The 2f1-f2 DPOAEs were recorded using an Otodynamics analyser (DP Echoport ILO 292, ILO version 6 software). For both groups, DPOAE measurements were performed in a doubled-walled sound-treated room and the ambient noise levels were monitored and maintained at ≤ 35 dB (A),[11] using a Bruel and Kjaer type 2232 precision sound level meter.

Two primary tones at frequencies f1 and f2 were presented, simultaneously, at constant stimulus levels, L1=65 dB SPL and L2=55 dB SPL. The f2/f1 ratio was fixed at 1.22. These frequency ratio and stimulus levels have previously been reported to produce robust DPOAEs.[4,11,14,24] The primary tones were presented such that the f2 frequencies corresponded with the audiometric frequencies at 2, 3, 4, 6 and 8 kHz. DPOAEs were recorded using the f2 frequency range from 750 to 8000 Hz, with recordings done at three points per octave.[1,5,25,26] DPOAE frequency analysis was then performed at 2002, 3174, 4004, 6348 and 7996 Hz, as DPOAEs are reported to be more stable over this frequency range.[27] The 2f1-f2 DPOAE response amplitudes (in dB SPL) were recorded as a function of the f2 frequency.[28]

A probe calibration test was performed at the beginning of each session of recordings, using the Otodynamics-supplied 1 cc calibration cavity. For each participant, the DPOAE recordings were repeated four times in one ear without removing the probe tip between measurements. After testing the first ear, a new probe tip was used on the second ear, and the DPOAE recordings were repeated four times, again without removing the probe tip. This single probe fit paradigm has been shown to produce more repeatable and reliable DPOAE responses.[29-32]

The DPOAE response amplitudes for the four repeated recordings were averaged, to give an average DPOAE amplitude value at each stimulus frequency for each ear. Similarly, the DPOAE noise floor levels for the four repeated recordings were averaged, to give an average noise floor level at each specific stimulus frequency for each ear. Only participants with present DPOAEs at at least one of the frequencies,

2002, 3174, 4004, 6348 and 7996 Hz were included in the final analysis. DPOAEs were considered to be present when the average DPOAE response amplitude was ≥6 dB SPL above the noise floor level.[8]

Statistical analysis

All statistical analyses were performed using IBM SPSS version 18 software. The DPOAE responses were described and analysed using both descriptive and inferential test statistics. The mean DPOAE response amplitude levels in the control and the noise-exposed groups were compared per frequency using the independent samples two-tailed t-test.[33] The percentage of present DPOAEs for the control and the noise-exposed groups were compared using the chi square test or the Fisher's exact test.[33] Differences in DPOAE response amplitude test-retest repeatability and reliability for the two groups were determined using one-way repeated measures ANOVA and the intraclass correlation coefficient, respectively.[33] All tests results were considered statistically significant at $p<0.05$.[33]

Ethical considerations

The study was approved by the University of Pretoria Research and Ethics Committee (Ref No: 14336392) and the Botswana Ministry of Health Research Committee (Ref No: PPME-13/18/1 VOL IX (154)). Permission was also obtained from all the relevant authorities.

RESULTS

The 20 noise-exposed participants had a mean age of 36.9±11.5 years (range 22 to 54 years). The average noise exposure duration was 10.9±6.5 years (range two to 22 years). The 20 control participants had a mean age of 34.6±7.5 years (range 19 to 55 years). The difference in age profile between the two groups was not statistically significant, $p>0.05$. Only 55 % of the noise-exposed participants reported using hearing protection devices (earplugs) consistently.

PTA testing: mean hearing thresholds

All participants in both groups had normal hearing thresholds (≤15 dB HL) at 0.25, 0.5, 1, 2, 3, 4, 6 and 8 kHz. The right and the left ear PTA hearing thresholds for both groups did not differ significantly across all the tested frequencies, therefore their data were combined for further analysis. Figure 1 shows the mean PTA thresholds for the two groups.

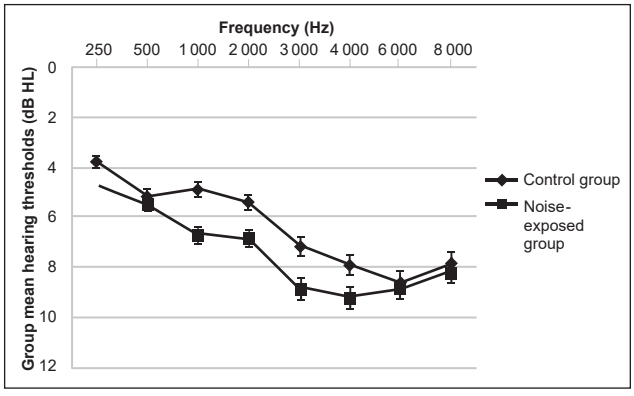


Figure 1. Mean pure tone audiometry (PTA) hearing thresholds for the control and noise-exposed groups (error bars represent a ±5% error range for each frequency)

The mean PTA hearing thresholds for the noise-exposed group were higher than those for the control group across all tested frequencies from 250 Hz to 8 kHz, but the difference between the two groups across all the frequencies was not statistically significant.

DPOAE testing: response amplitudes

The 2f1-f2 DPOAE response amplitudes in the right and left ears were compared, using a paired samples t-test. For all the five recorded frequencies between 2002 and 7996 Hz, no statistically significant difference in mean response amplitude levels was observed between the right and the left ears ($p>0.05$), therefore the data were combined for further analysis. Table 1 shows the number of ears with present DPOAEs in the 40 ears of each of the control and the noise exposed groups, as well as the mean DPOAE response amplitudes of ears with present DPOAEs per group, in each of the five recorded frequencies.

Table 1. Mean DPOAE response amplitudes and the number of ears with present DPOAEs for the control and the noise-exposed groups

DP-gram Frequency (Hz)	Present DPOAE (N)		DPOAE Amplitude Mean ± SD (dB SPL)		P-Value
	Control	Noise-exposed	Control	Noise-exposed	
2002	40	38	13.6 ± 4.5	6.6 ± 5.9	<0.001
3174	40	33	12.5 ± 4.5	4.4 ± 5.1	<0.001
4004	40	26	12.5 ± 4.1	4.8 ± 4.4	<0.001
6348	39	8	8.2 ± 6.5	1.7 ± 4.0	0.010
7996	32	7	1.1 ± 5.2	-2.4 ± 1.1	0.001

Differences in means were compared using the independent samples t-test

The DPOAE response levels for both groups progressively decreased with increasing stimulus frequency. DPOAE response amplitudes were significantly lower in the noise-exposed compared to the control group for all the tested frequencies (Table 1): by 7 dB SPL at 2002 Hz, 8.1 dB SPL at 3174 Hz, 7.7 dB SPL at 4004 Hz, 6.5 dB SPL at 6348 Hz, and 3.5 dB SPL at 7996 Hz.

DPOAE testing: DPOAE presence

The percentages of present DPOAEs for the two groups are illustrated in Figure 2.

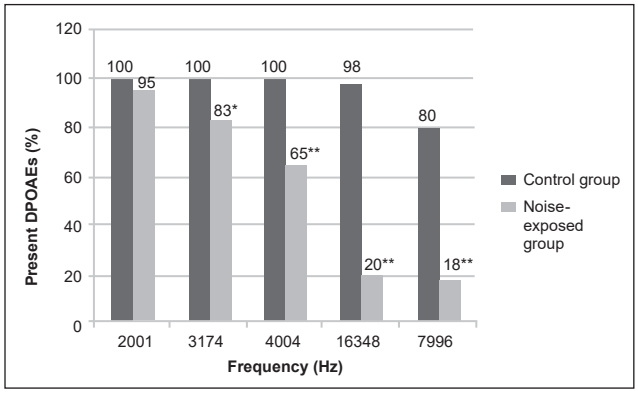


Figure 2. Percentage of present DPOAEs for the control and noise-exposed groups Fisher's exact test, *p<0.05, Chi square test, **p<0.001

Figure 2 shows a high proportion of present DPOAEs for the control group: 100% for all 40 ears at 2002, 3174 and 4004 Hz, 98% (39 ears) at 6348 Hz, and 80% (32 ears) at 7996 Hz. Conversely, the percentage of present DPOAEs was significantly lower in the noise-exposed group compared to the control group (except at 2002 Hz), and decreased progressively, from 2002 Hz to 7996 Hz.

DPOAE testing: repeatability and reliability

Table 2 shows that the DPOAE response levels between the four recordings were not statistically different for the five frequencies. The repeated DPOAE measurements further showed a high degree of reliability as indicated by the intraclass correlation coefficients.

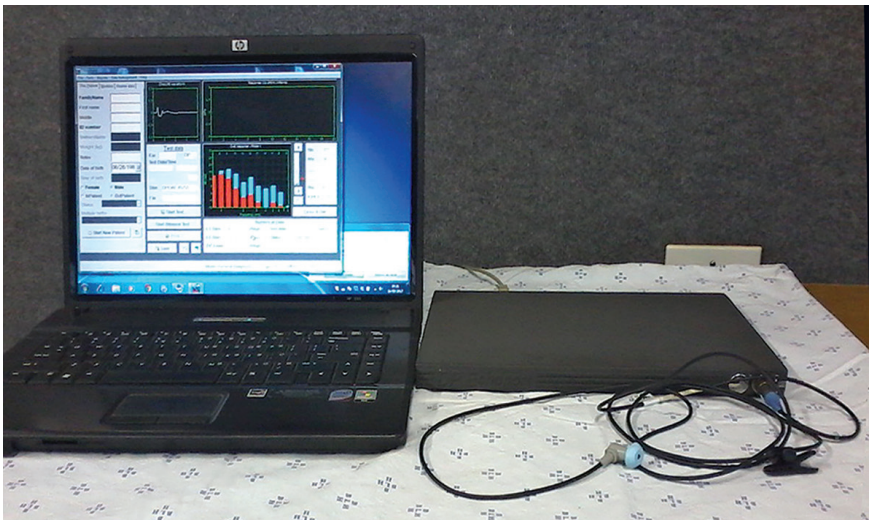
DISCUSSION

Several studies have demonstrated that excessive noise exposure may decrease DPOAE response levels.[1,12,34-36] The current study compared the DPOAE response amplitudes between control and noise-exposed participants and found significantly lower DPOAE response amplitudes in the noise-exposed group at all the tested frequencies, from 2002 to 7996 Hz. The largest differences in

Table 2. Mean DPOAE response amplitudes for the four repeated recordings

DP-gram Frequency (Hz)	Mean DPOAE response amplitude (dB SPL) DPOAE Recording				P-Value	Intraclass correlation coefficient (ICC)	95% CI of ICC
	1st	2nd	3rd	4th			
2002	10.1	10.1	10.3	10.2	0.31	0.996	0.995 - 0.997
3174	8.7	8.8	8.9	9.0	0.86	0.997	0.995 - 0.998
4004	9.2	9.4	9.6	9.6	0.06	0.993	0.989 - 0.995
6348	6.8	7.1	7.3	7.1	0.11	0.994	0.991 - 0.996
7996	0.5	0.4	0.5	0.6	0.82	0.989	0.982 - 0.994

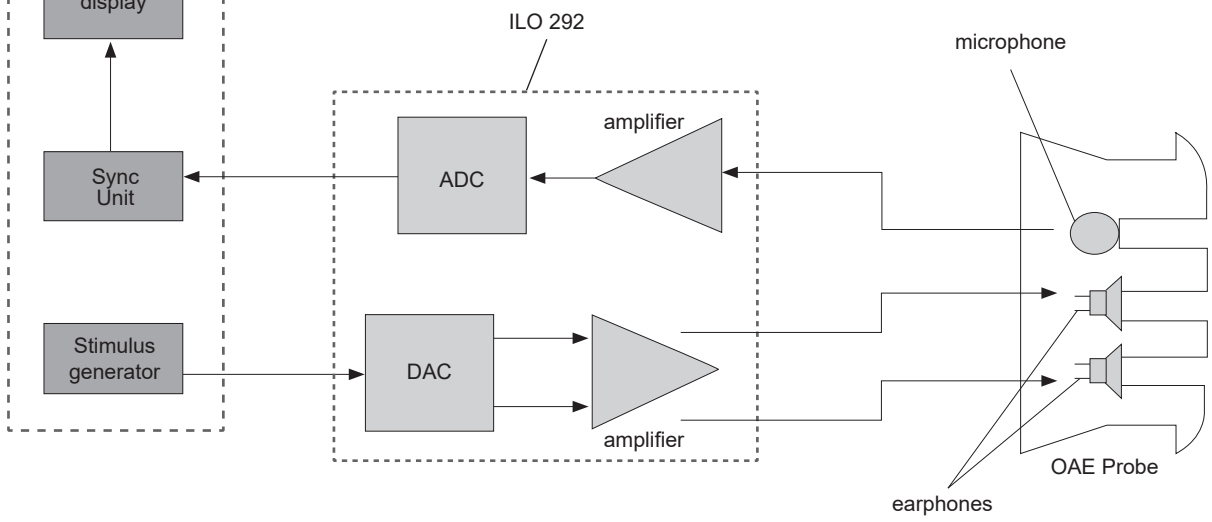
Mean DPOAE response amplitudes compared using one-way repeated measures ANOVA and intraclass correlation coefficients

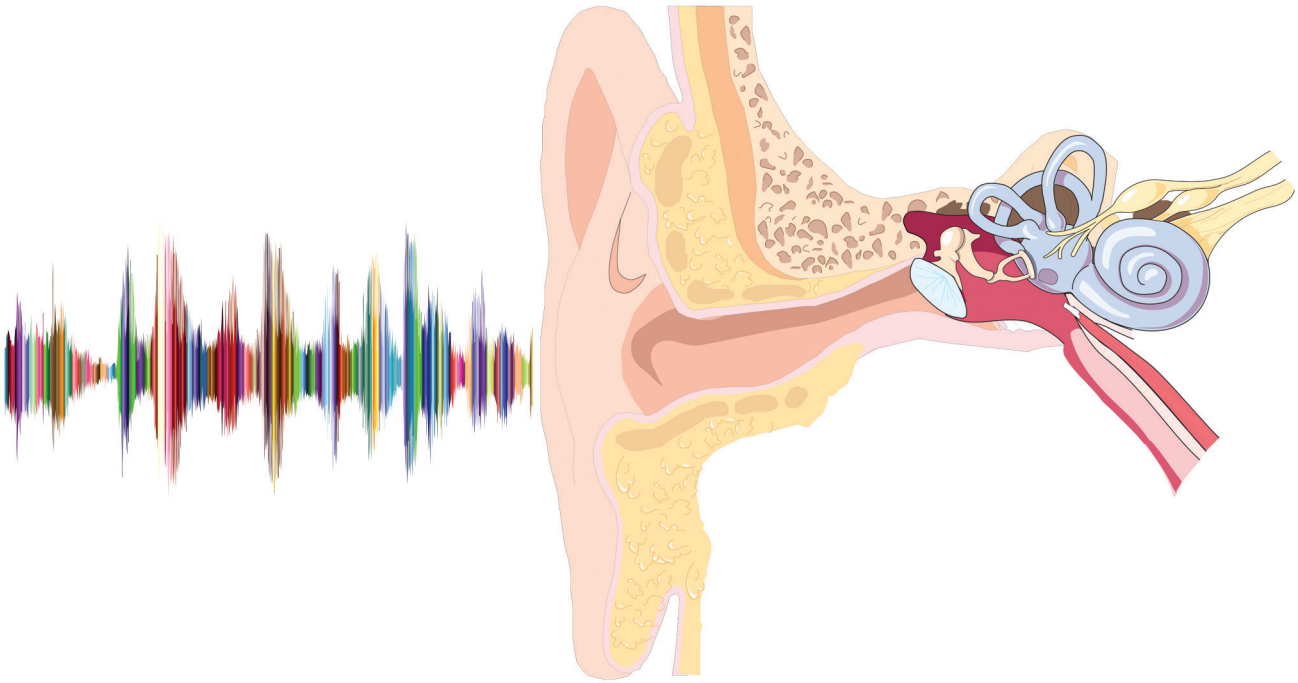


DP Echoport ILO 292 connected to PC, used for DPOAE testing

Photograph: Meshack Moepeng

Schematic diagram for equipment set-up used to record DPOAEs. The arrows indicate the direction and path followed by the acoustic signal from the stimulus generator in the PC to the earphone incorporated within the OAE probe placed in external ear canal, and the direction and path followed by the OAE response recorded in the microphone within the OAE probe to the processor (responsible for data storage, analysis and display) in the PC





emission levels were observed at 3174 and 4004 Hz, where mean DPOAE response amplitude levels for the noise-exposed group were lower than those for the control group responses by 8.1 and 7.7 dB SPL, respectively. This occurred despite the fact that all the participants had normal audiometric thresholds and the difference in PTA hearing thresholds between the two groups was not statistically significant. Thus, by using DPOAEs, it was possible to detect cochlear damage in the noise-exposed participants before it was evident on the audiogram.[37] These findings suggest that DPOAE testing could be a sensitive test in detecting subtle cochlear function changes due to long-term noise exposure. This is consistent with reports from other studies.[1,5,9,12,16,34]

The smallest DPOAE response amplitude difference of 3.5 dB between the control and the noise-exposed groups was observed at 7996 Hz. This may be an indicator of a marginal effect of noise exposure on cochlear function at this frequency.[38]

Vinck et al.[12] exposed subjects to 90 dB SPL broad band noise for one hour and found that DPOAEs were significantly reduced, while PTA hearing thresholds showed no significant threshold shifts. DPOAEs did not fully recover to the pre-exposure reference levels in the 4 kHz frequency region one hour post exposure. The authors concluded that DPOAEs could be used for the early detection of subtle outer hair cell function changes due to noise exposure. However, there are still different views regarding the applicability of DPOAEs in the early detection of occupational NIHL. Seixas et al.[38] found no evidence to support the use of DPOAEs as a sensitive test for the early detection of noise-induced cochlear damage. This discrepancy could be due to the different study designs used.[12]

The current study further showed a significantly higher percentage of present DPOAEs from 3174 to 7996 Hz in the control group compared to the noise-exposed group. Similar findings have been reported by other studies.[1,5,9,34] This lower percentage of present DPOAEs observed in the noise-exposed group, despite the fact that all participants had normal audiometric thresholds, further suggests that DPOAEs could be a sensitive test for the detection of subtle cochlear function changes.

The significantly lower DPOAE response amplitude levels across all the frequencies in the noise-exposed group, accompanied by the significantly lower percentage of present DPOAEs evident in most of the frequencies for the same group, even though all participants had normal audiometric thresholds, suggests that DPOAEs could detect early noise-induced outer hair cell damage before it is evident on the audiogram. It appears that DPOAE amplitude reduction or absent DPOAEs could be an early indicator of NIHL even when the audiogram is normal. The reduction in DPOAE amplitude may be an indicator to act to prevent further outer hair cells damage before the pure tone audiogram starts showing some hearing loss.[37]

The study showed that DPOAE measurements are highly reliable and repeatable, in accordance with other studies.[29-32,37] Due to the high test-retest reliability of DPOAEs, some researchers are propounding the applicability of DPOAEs as a health surveillance hearing screening tool in industry.[39,40]

The study findings suggest that detecting subclinical noise-induced cochlear function changes, using either DPOAE amplitude reduction or absent DPOAEs, might be an essential step in preventing irreversible noise-induced cochlear damage in workers in the steel manufacturing industry presenting with normal audiometric hearing thresholds. The findings further support the view that DPOAEs could be used to identify ears with early noise-induced outer hair cell damage that present with normal audiometric thresholds. DPOAEs might be used as a quick, objective tool to assess the status of the cochlea and thereby complement conventional PTA in the early detection of NIHL in the steel manufacturing and other industries.[1,3,16]

LIMITATIONS

This study used a small sample size, and the noise-exposure levels

for participants in both groups were not measured. Both these factors could reduce the validity of the results. A cross-sectional study design was used, so the cause-effect relationship between subclinical cochlear function changes and DPOAEs could not be assessed. The inter-test retest reliability of DPOAEs was also not determined.

RECOMMENDATIONS

Large-scale longitudinal studies, considering different testing environments (e.g. clinical versus industrial settings) and noise-exposure level measurements, are recommended to substantiate the findings from this study. A future study should use age-matched participants with measured noise-exposure levels to further evaluate the relationship between noise-exposure and DPOAE amplitude response levels. Furthermore, the inter-test retest reliability of DPOAEs (fitting, removing and refitting the probe) in the steel manufacturing industry should be investigated.

CONCLUSION

The findings of the current study suggest that DPOAEs could be a more sensitive test in detecting noise-induced subtle cochlear function changes. DPOAEs could be used as a health surveillance technique to complement PTA in the early detection of NIHL in the steel manufacturing industry.

LESSONS LEARNED

1. DPOAE amplitude reduction or absent DPOAEs could be an early indicator of NIHL even when the audiogram is normal.
2. DPOAEs could be used as a quick, objective tool for the early detection of noise-induced subtle cochlear function changes in steel manufacturing industry workers.

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The compelling case for supporting pregnancy and breastfeeding in the workplace

P Reimers

Department of Paediatrics and Child Health, University of KwaZulu-Natal, Durban, South Africa

Correspondence: Dr Penelope Reimers, Department of Paediatrics and Child Health, University of KwaZulu-Natal, 719 Umbilo Rd, Durban 4001, South Africa. e-mail: pennyreimers@outlook.com

ABSTRACT

The Lancet Breastfeeding Series is a comprehensive study that evaluated breastfeeding globally, and researched the short- and long-term implications of not breastfeeding on maternal and infant health in low- and high-income countries. The evidence has provided opportunities to eliminate the identified barriers to breastfeeding, and turn the tide on the unacceptably high infant and maternal mortality and morbidity rates. Highlighted in the report were the increasing numbers of women in the workforce, the negative effects of work on breastfeeding, and the urgent need to reduce barriers to breastfeeding within the workplace by ensuring maternity protection, support and nursing breaks for working mothers. Commitment by governments, society and businesses is urgently required to provide enabling environments, societal acceptance of breastfeeding as the norm, and workplace policies that enable women to breastfeed optimally. The Lancet Series warns that, without this, the "major losses and costs will be borne by generations to come."

Keywords: **breastfeeding, employment, workplace, lactation support, workplace interventions**

INTRODUCTION

In recent years, there has been an exponential increase in the number of women employed outside the home, without much time and attention paid to issues around pregnancy and breastfeeding in the workplace. In fact, working and breastfeeding have been largely regarded as mutually exclusive. However, a wealth of research regarding the health and economic benefits of supporting breastfeeding makes this topic increasingly unwise to ignore. Having an organisational culture supportive of pregnancy and breastfeeding is imperative to ensure early intervention and good outcomes for both the mother and her infant.[1] In addition, legislation in South Africa demands that the rights of the pregnant and breastfeeding woman, and those of her infant, are protected.[2-6]

WHY BREASTFEEDING?

The World Health Organization (WHO) recommends exclusive breastfeeding for the first six months and advocates continuing breastfeeding for two years and beyond. In South Africa, the prevalence of exclusive breastfeeding is estimated to be only 25.7% at six months.[7]

The recent Lancet Breastfeeding Series, published in 2016, presented compelling evidence about short and long-term health implications of breastfeeding, and how critical it is for reducing mortality and morbidity of both mother and child.[8] This holds true for low-, middle-, and high-income countries.

There is evidence that improving breastfeeding practices could, globally, save the lives of over 820 000 children a year: 13% of all deaths under five years of age. In addition, increasing breastfeeding can prevent nearly half of the cases of diarrhoea and one third of respiratory infections – both leading causes of death among children aged under five years. In terms of maternal health, improved breastfeeding rates could save 20 000 deaths from breast cancer and reduce the incidence of ovarian cancer.[8] The Lancet Series found that cognitive losses in children who were not breastfed resulted in an estimated reduction in annual earning potential of $302 billion.[8] In light of the overwhelming evidence, countries and governments are duty-bound to introduce policies supportive and protective of breastfeeding; it is a win-win solution for all.

MATERNITY PROTECTION AND BREASTFEEDING BREAKS

Maternal employment is a leading cause for not initiating or continuing breastfeeding[10] and short maternity leave (< six weeks) is responsible for a fourfold increase in the cessation of breastfeeding.[11] The Maternity Prevention Convention of the International Labor Organization (C183) has laid down recommendations for paid maternity leave and lactation breaks.[12] These include maternity leave of longer than 18 weeks, with a minimum of six weeks compulsory leave after delivery; daily breaks or reduction in working hours for nursing mothers; the provision of facilities for nursing mothers; and payment of maternity benefits of not less than two-thirds of the salary.

This Convention has not been fully adopted in South Africa (SA). Maternity leave in SA is less than 18 weeks, and daily breaks and a reduction in working time for breastfeeding mothers are suggested

but seldom provided, as are breastfeeding facilities in the workplace; maternity benefits are less than two-thirds of the salary. Only 53% of 185 countries included in the Lancet Breastfeeding Series met the 14-week minimal standard, and only 23% met the recommendation of 18 weeks leave.[8] In the informal work sector, almost 80% of working women, who live mainly in Africa and Asia, have no maternity benefits at all.[8]

In Europe, daily breastfeeding breaks for mothers range from 60 minutes in Spain, to two hours in Norway, Austria and Italy.[13] In South Africa, the Basic Condition of Employment Act Code of Good Practice suggests that women with an infant younger than six months be allowed two 30-minute breaks during the working day, to either breastfeed or express breast milk.[3] No provision is made for babies older than six months. However, the powerful Normalise Breastfeeding social media campaign in South Africa has lobbied government, and legislation changes to further accommodate breastfeeding women at work and in public have been proposed.[13]

The South African Constitution grants all South African women formal recognition as citizens equal to men. Consequently, women may not be discriminated against on the grounds of gender or pregnancy. It is interesting to consider whether breastfeeding could be regarded as a woman's right, as first suggested by Labbok.[14] If a mother's choice to breastfeed were considered her right, then simply returning to employment should not deny her that right. Nor should it deny her child who, under separate Acts, is entitled to the right to the highest attainable standard of health, the right to be breastfed.[15,16]

CREATING A SUPPORTIVE ENVIRONMENT IN THE WORKPLACE

The law clearly protects the rights of pregnant and breastfeeding women in the workplace, and employers are obligated to supply information and training regarding related risks to health and safety, and how to minimise these risks.[3] Allowing women the time to attend antenatal clinics is also mentioned. Despite this, many women feel disadvantaged when pregnant, as pregnancy is often not welcomed by employers and colleagues. It is viewed as an inconvenience that is disruptive to work and that places more pressure on colleagues who will carry the burden during the maternity leave. Consequently, many delay the announcement of their pregnancy.[17]

Women who feel that the organisational structure is supportive will report pregnancies early, ensuring that the necessary steps are taken to conduct a risk assessment of the physical, chemical, ergonomic and biological environments in which they work. The early weeks of pregnancy are the most critical for exposure and potential detrimental effects on the developing foetus. A supportive culture contributes to reduction in stress, decreasing the risk of preterm delivery and contributing to greater job satisfaction. Balancing the dual role of mother and employee provides significant challenges to pregnant women, and the work culture largely determines maternal psychosocial health and intentions to return to work after maternity leave.[18]

INTERVENTIONS TO SUPPORT BREASTFEEDING

Research has shown that the most powerful workplace interventions to support breastfeeding women are education of employed mothers on the management of breastfeeding with employment;[19-25] enhancing the employer's knowledge about the benefits of supporting breastfeeding;[26,27] providing physical facilities for lactating mothers;[28-30] having childcare facilities within or close to the workplace;[31] providing storage facilities for expressed breast milk;[32,33] allowing job flexibility;[34,35] and developing mother-friendly policies that support breastfeeding.[36] Table 1 lists prerequisites for enabling women to sustain lactation and express milk during their working days.[37]

Table 1. Prerequisites for lactation support in the workplace

Prerequisite	Motivation
Time (job flexibility)	Expressing milk or breastfeeding takes time. Women need ± 20 minutes to express milk; in an eight-hour day they will need to express two to three times, depending on the age of the baby.
Support (policies that support breastfeeding)	Women need support from their line managers, colleagues and other breastfeeding mothers.
Space (physical facilities)	Women need private space (with a plug point for electric breast pumps), a hand basin, and a fridge in which to store milk; the room should have a key so that it can be locked for privacy, and must not be a bathroom.
Enhancing employers' knowledge (education of management)	Someone (in the human resources or administration department) must be assigned the responsibility of ensuring twhat breastfeeding women are adequately supported.

BREASTFEEDING POLICY

A written breastfeeding policy should be communicated to all employees prior to pregnancy. The policy should address education around the initiation and sustaining of breastfeeding during maternity leave planning; advice on the transition from maternity leave to employment and the resultant impact on breastfeeding; and breastfeeding breaks allowed and facilities available for expressing milk. In Australia, where companies communicated their breastfeeding policies, 61% of women were exclusively breastfeeding at six months; where there was no policy or women were unsure if one existed, only 34% were exclusively breastfeeding.[38]

Enhancing skills and knowledge

Education around lactation and breastfeeding should include how to start breastfeeding immediately after delivery, realistic expectations around demand feeding, boosting maternal confidence by providing skills to deal with common problems, and ensuring that women have support on hand. Tables 2 to 4 list helpful information for nurses within the occupational health setting to share with lactating women. Knowledge about how to combine work and breastfeeding is also essential, as is advice on effective milk expressing techniques.

Table 2. Advice for women during maternity leave[39]

1	Take off as much time as possible, add annual leave to maternity leave.
2	Breastfeed frequently in early weeks to build up a good supply for later.
3	Practice expressing only once feeding is established, at around six weeks.
4	Help the baby adjust to taking milk from a cup/bottle just before you go back to work, not sooner.
5	Talk to family and the childcare provider about plans and get their support.

Table 3. Advice for women returning to work[39]

1	Talk to the supervisor prior to returning to work to make arrangements about facilities and expressing milk.
2	Work from home or work part-time, if possible.
3	Go back on a Thursday when first returning to work.
4	Take Wednesdays off for a few weeks.
5	Work split shifts, if possible.
6	Look for childcare close to work.
7	When collecting the baby, take time to feed first before driving home.

Table 4. Suggested pumping schedule for women at work (infants under six months)

Time	Activity
6 am	Breastfeed infant before leaving for work
8 am	Start work
9.30 am	Express milk
12 noon	Express milk (use lunch break)
2.30 pm	Express milk
5 pm	Leave work and breastfeed at day care

Table 5 provides suggestions for setting up a lactation room and the equipment required.

Table 5. Best practice for lactation rooms[37]

Privacy and a lockable door
Table and a comfortable chair
Electric outlet
Wash hand basin with soap and paper towels
Waste paper basket
Refrigerator
Mirror
Clock
Where possible, a double electric hospital grade breast pump - each mother to bring her own tubing

DIFFICULTIES WOMEN MIGHT ENCOUNTER IN THE WORKPLACE

Many women are unaware of their rights to breastfeeding breaks and many employers are equally unaware that these breaks are a legal requirement. Due to the sensitive nature of breastfeeding, employees do not feel confident about raising the issue with management, and trade unions generally do not see breastfeeding as an important issue. Some workplaces do not provide a clean, private, appropriate place for women to express milk and, as a result, some women are forced to use public toilets for this activity. Attitudes around inadequacy of breast milk to meet the needs of their infants and fears around insufficient supply are common, and can be addressed through education, self-efficacy and good breastfeeding practices.

INCREASING AWARENESS OF THE RIGHTS OF WOMEN TO BREASTFEED IN THE WORKPLACE

Increasing awareness should be done through establishing support groups to educate and inform women about breastfeeding at work, and using women who have successfully combined the roles of breastfeeding and working as role models. Educating shop stewards around the importance of breastfeeding will increase their awareness and that of the unions. Meetings can be arranged with human resource management to present research on the benefits for the business. In addition, if no facilities to express in the workplace exist, a private space for this purpose should be identified.

BENEFITS FOR BUSINESS

Many studies have shown that supporting breastfeeding reduces loss of skilled staff, decreases costs associated with recruitment, reduces absenteeism due to improved health of mother and infant, and increases staff loyalty.[40] In addition, there is the added benefit of the corporate image and media recognition.

CONCLUSIONS AND RECOMMENDATIONS

As stated in the Lancet Breastfeeding Series, not breastfeeding is associated with increased mortality and lower intelligence which reflects in annual economic losses of around $302 billion or 0.49% of world gross national income.[8] To reverse this situation and advance physical and psychological health and economic gains, breastfeeding needs support: financial, political and societal.

Breastfeeding does not occur in a vacuum and it is not the sole responsibility of an individual. It is a combined societal responsibility, and is influenced by social and cultural attitudes. Rebuilding a breastfeeding culture is the only way to restore and improve breastfeeding rates. Women need to be supported to breastfeed their babies in public places; they need breastfeeding facilities in shopping centres, and employers and employees need to support the provision of facilities for a woman to express milk in the workplace. Healthcare workers who provide guidance on breastfeeding at critical time points need updated knowledge and skills to enable them to provide good evidence-based advice, as considerable gaps in their breastfeeding knowledge have been identified.[41,42]

Reducing the barriers to breastfeeding in the workplace by providing a supportive culture, lactation rooms and breastfeeding breaks for women to express milk would not only improve the short- and long-term health of mothers and their infants, but would also reduce company costs and absenteeism, and improve performance and commitment.[43] Occupational healthcare workers can and should play an important role in creating a safe and supportive environment and positive attitudes towards pregnancy and breastfeeding in the workplace. They can do this by ensuring that management has a breastfeeding policy that is clearly communicated to all employees. Supportive actions include educating supervisors to allow breastfeeding breaks, and making sure they are flexible as women acclimatise and merge breastfeeding and work. Champions and role models in the workplace are invaluable in providing reassurance and helping to ease the anxiety when the time comes to return to work.

DECLARATION

The author has no conflict of interest or affiliation to declare.

LESSONS LEARNED

1. Breastfeeding can turn the tide on the unacceptably high infant and maternal mortality rates.
2. Full-time employment negatively affects breastfeeding.
3. Governments, society and business should provide supportive environments to enable women to breastfeed as per WHO recommendations.
4. Fostering a supportive culture while providing lactation rooms and breastfeeding breaks for women to express milk will improve health, reduce company costs and absenteeism, and improve employee commitment.

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Safety and health in mining: Part 3

K Elgstrand[1], DL Sherson[2], E Jørs[3], C Nogueira[4], JF Thomsen[5], M Fingerhut[6], L Burström[7], H Rintamäki[8], E Apud[9], E Oñate[9], N Coulson[10], L McMaster[11], EE Clarke[12]

1 Department of Occupational and Environmental Medicine, Uppsala University, Uppsala, Sweden
2 Department of Occupational and Environmental Medicine, Odense University Hospital, Odense, Denmark
3 Clinic of Occupational and Environmental Medicine, Odense University Hospital, Odense, Denmark
4 Occupational Health Consultant, Johannesburg, South Africa
5 Department of Occupational and Environmental Medicine, Bispebjerg University Hospital, Copenhagen, Denmark
6 Occupational Health Consultant, National Institute for Occupational Safety and Health, Washington, USA
7 Department of Public Health and Clinical Medicine, Umeå University, Umeå, Sweden
8 Finnish Institute of Occupational Health, Helsinki, Finland
9 Department of Ergonomics, University of Concepción, Concepción, Chile
10 Centre for Sustainability in Mining and Industry, University of the Witwatersrand, Johannesburg, South Africa
11 Chamber of Mines, Johannesburg, South Africa
12 Occupational & Environmental Health Unit, Public Health Division of the Ghana Health Service, Accra, Ghana

Correspondence: Ms Claudina Nogueira, c/o South African Society of Occupational Medicine (SASOM), PO Box 32, Silverton, 0127, South Africa. e-mail: claudinanogueira@hotmail.com

Claudina Nogueira is a member of SAIOH and SASOM; and a Board member of ICOH and Workplace Health Without Borders.

Safety and health in mining is a position paper summarising key occupational safety and health risks in mining and their prevention. The paper is a joint effort by the members of the Scientific Committee on Mining Occupational Safety and Health (SC MinOSH) of the International Commission on Occupational Health (ICOH). The position paper will be published in three parts, in *Occupational Health Southern Africa*. The abbreviations and references used will be listed for each of the three parts. References are numbered consecutively across the three parts. The paper will also be published in its entirety on the ICOH website, as an output of SC MinOSH.

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PART 3

4. SPECIAL ISSUES IN INFORMAL MINING

The definition of artisanal and small-scale mining used here denotes 'mining by any method not involving substantial expenditure by an individual or group of persons, not exceeding nine in number, or by a co-operative society made up of ten or more persons'.[161] This definition encompasses what is termed 'artisanal' operations that use only rudimentary implements, as well as mining that involves more sophisticated activities but operates at a relatively low level of production and requires limited capital investment. Processing of raw materials is often done in homes or near settlements. Sometimes, water sources that are used to treat the mineral resources, are also used as sources of domestic water supply.[17]

The United Nations Department of Economic and Social Affairs (UNDESA) describes small-scale mining as largely poverty-driven.[162] Linked with poverty are many direct and indirect factors that contribute to challenges to human health in artisanal and small-scale mining communities.[77] Most mining community residents live in rural settings that lack basic resources, such as healthcare services and clean potable water. In artisanal and small-scale mining areas, there is often little separation between residential and mining activities and thus, community residents tend to be exposed to hazards that arise from mining activities. The interplay of occupational and general environmental factors with the socio-economic aspects necessitates that health impacts are viewed from a broad public health perspective.[163] 'Public health' as used here encompasses the broad notion of health as being 'not merely the absence of disease, but a state of complete physical, social and psychological wellbeing'.[164]

4.1 Impacts on community health

The focus of this section is on communities residing in the locality of artisanal and small-scale mines.

Health effects of chemicals

Studies on artisanal and small-scale mining communities worldwide have provided some evidence of acute and chronic mercury-associated adverse health outcomes mediated through exposure to mercury. This exposure is caused by inhalation of inorganic or elemental mercury during smelting of amalgam, or ingestion of methylmercury in fish from contaminated water bodies, with effects on the renal, nervous, and immune systems.[77,165,166] Risk assessments of heavy metal concentrations, especially arsenic, in surface and groundwater samples, and in cassava from four mining communities in the Western Region of Ghana, found cancer risks to be higher than the US Environmental Protection Agency's (EPA) acceptable range.[167, 168] However, no data exists on cancer rates in artisanal and small-scale mining sites, and further research is required to determine if such exposures might affect health outcomes in these communities.[106]

The respiratory health of miners involved in artisanal and small-scale mining has not been studied extensively.[106] However, it is known that, in addition to biomass cooking smoke which is a major concern for respiratory health in rural communities, exposure to respirable crystalline silica, which exceeds 30% in some gold ore dusts, might occur.[169-171]

It is worthwhile to consider that, in low-income countries, mixtures of hazardous substances within the vicinity of small-scale enterprises, smelters, mines, agricultural areas, toxic waste disposal sites, etc., often present complex health hazards to the local populations. Hence, there is a need to study the toxicological effects of mixtures of metals, pesticides, and organic compounds in these different exposure scenarios, of which artisanal mining is an example.[172]

Noise

While noise is typically treated as an occupational hazard and is a public health concern, limited information is available on noise exposures associated with artisanal and small-scale mining processes, in miners or residents.[106,173] Many tasks carried out within the artisanal and small-scale gold mining (ASGM) work process (extraction, crushing and milling) are associated with elevated occupational and community noise levels, often to levels that exceed guideline limits for the prevention of noise-induced hearing loss (NIHL), as reported by the WHO.[174]

An Ecuadorian study in gold miners working in small-scale mines showed noise levels above 85 dB(A), largely dependent on the work area, and a prevalence of 32% of work-related sensorineural hearing loss, with a fourfold increased risk of developing NIHL in those working for longer than ten years.[42] A pilot study in Ghana measured occupational noise exposures among residents of an ASGM community and documented average exposures during mining activities in the region of 85 dB(A); during grinding or crushing operations, the noise levels exceeded 92 dB(A).[108] In a study of noise exposures among individuals residing in a Nicaraguan ASGM community, miners and non-miners reported exposure to loud noise for more than 40 hours per week.[175] These and other studies indicate that health effects related to noise are not confined to mine workers, since it is common for mining activities to be interspersed within residential and commercial areas.[176]

Injuries

Very little information is available regarding occupational injuries in artisanal and small-scale mining operations. Further, there is no systematic national- or local-scale injury surveillance. A study in the small-scale mining district of Geita in Tanzania showed that district mining accidents were responsible for about 11 fatalities annually, with the main causes of accidents nationwide being tunnel collapses.[177] A study of an ASGM community in the Democratic Republic of the Congo revealed that 392 accidents had occurred during the 12 months preceding the study, affecting 72% of the miners, with most affected by accidents involving tool handling.[178] Data from Zimbabwe showed that ground falls and machinery/vehicle accidents were each responsible for 25% of reported mine fatalities in 1997. The study also estimated that two unreported deaths per month could occur during illegal mining of closed mines and unsafe alluvial mining.[179] Due to the ASGM process being relatively comparable across regions, similar patterns in injuries and accidents can be expected in other areas. The International Labour Organization (ILO) estimates that artisanal and small-scale mining operations worldwide are burdened by six to seven times more non-fatal accidents than large-scale operations.[17] Injuries are known to have tremendous economic and social impacts on affected workers, as well as society as a whole.[180] Many factors are involved in evaluating the costs of injuries and fatalities, including healthcare costs, lost productivity for the injured worker, disability costs, and quality of life costs. Accidents and fatalities adversely affect both the injured parties and their families.[106]

Nutrition

In addition to concerns about nutritional intake and food insecurity, there are concerns about food safety in artisanal and small-scale mining communities. Fish and other edible items from mining areas have been found to contain mercury and other heavy metals that likely entered the environment because of mining practices.[181]

HIV/AIDS and sexual health

Due to socio-cultural and socio-economic factors,[182] members of small-scale mining communities, particularly ASGM communities, might be especially vulnerable to Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) and other sexually-transmitted infections (STIs).[183] Under-employment and related factors may encourage sex work, particularly among women.[163,184]

Water, sanitation and vector-borne diseases

Malaria transmission has been associated with increases in the amounts of standing water (ideal mosquito breeding sites) in the vicinities of living quarters in mining communities in Ghana and Brazil.[185,186] ASGM has also been cited as a risk factor for malaria and some other infectious diseases due to 'a possible reduction in acquisition of immunity that may be associated with conditions in gold mining, including mercury exposure', as stated by authors in Pará, Brazil.[187] Distances to remote gold mining sites[188] and the land use changes that often accompany ASGM, such as streambed disturbance, have been proposed as a mechanism for the spread of Buruli ulcer, a bacterial infectious disease affecting soft tissue.[189] In Ghana, the proximity of endemic Buruli ulcer communities to mining activity lends itself to speculation for ASGM as a risk factor for this disease.[188]

Psychosocial health

Population growth associated with small-scale mining can strain resources, and many communities remain impoverished without adequate infrastructure and health services. Poverty and unsanitary living conditions raise concerns for psychosocial stress, inadequate nutrition, infectious diseases, and untreated chronic conditions. Tensions and conflict within communities can add to stress, while violence increases the risk of injuries and fatalities. The lack of accessible

healthcare in many communities compounds these risks. Without financial resources to cope with injuries or disease, poverty increases the risk of livelihood 'shocks' that temporarily impact negatively on wellbeing. These shocks can perpetuate a cycle of poverty,[190-193] resulting in inadequate resources to sustain health. While evidence for physical health risks of ASGM is increasingly common in the literature, there are few studies on stress in artisanal and small-scale mining communities.[106]

4.2 Women and children mine workers

Africa is reputed to have the highest proportion of female miners in artisanal and small-scale mining; women constitute 40 to 50% of small-scale miners in Zimbabwe and 40% in Tanzania, while in India they constitute 30%.[194] Although it is estimated that more than one third of artisanal miners in Zimbabwe are women, a 2015 scoping study showed that only 11% of artisanal miners in the two target areas reviewed were women.[105] Generally, in Asia, less than 10% of miners are women, while in Latin America, they constitute 10 to 20% of the mining labour force.[194,195] The roles of women in small-scale mining have been largely overlooked by policy makers.[105,163]

4.2.1 Work activities undertaken by women

In some areas of Africa and elsewhere, women tend to be engaged in mineral processing, such as digging and crushing on the one hand, and transporting or wagon-loading on the other hand.[196] Hayes (2008) reported on a study in Africa where women are involved in almost all stages of small-scale mining, from digging, crushing and pounding rocks, transporting, washing and sorting materials, and processing (i.e. amalgamation of gold), to trading activities.[197] Women have also been cited for involvement in drilling and exploratory excavations, traditionally regarded as men's work.[198] Gueye (2001) reported that women involved in small-scale mining in Burkina Faso performed 90% of mine ore processing activities.[199] According to Chakravorty (2001), women are employed in mining activities because of their alleged feminine characteristics, such as being assiduous, systematic and dependable;[200] women also play multiple roles within their mining responsibilities, including being leaders of their groups and acting as conflict mediators.[201] In spite of the significant roles women play in small-scale mining activities, at all levels, they are rarely recognised as 'miners'.[202]

Most often, financial compensation for women lags behind that of their male counterparts. In some instances, e.g. the Philippines, women work without pay as they assist the male members of the family with this work.[203] According to the ILO,[17] women in artisanal and small-scale mining are usually compensated less than male mine workers. In the Birim North District in Ghana, women were paid various monthly rates in 2007, ranging from US$50 to US$100.[163] Bhagyalakshmi (2007) cites the monthly income of women in India as US$120,[196] and Hayes (2009) reports approximately the same income for women in the Democratic Republic of the Congo.[204] In Ecuador, female miners are called 'jancheras' and are mainly responsible for checking that no gold remains in the discarded materials.[42]

4.2.2. Women's health and safety

Many artisanal and small-scale mining operations are conducted illegally. Hence, government regulations on safety and health standards are not enforced, or the mine does not follow the regulations.[205] Lack of awareness of the risks inherent in mining, limited access to better equipment, and lack of proper education and training on safe work practices, are cited as factors leading to poor health and safety practices for all workers in small-scale mining.[23, 205] However, women in mining are confronted with these issues in addition to those related to the double burden of work-home responsibilities.[205] Women in Bolivia have been noted to work long shifts, and are exposed to contaminated water without any protection.[206] Other hazardous exposures for women in these environments include silica dust and dusts from manganese and other minerals, which may cause respiratory diseases, and also toxic chemicals like cyanide or mercury, used in extracting gold. The health of these women is compromised; millions of workers, including women and children, die or are injured annually due to mining work.[205] Life expectancy of women engaged in small-scale mining in Bolivia is rarely above 40 years.[206]

Exposure to dust is a common hazard among women in mining, particularly those women involved in the crushing of ore.[198] The dust, when inhaled, can cause lung diseases and other respiratory ailments. Exposure to dust can also cause skin irritation and eye damage. Protective measures tend to be inadequate; for instance, Bhagyalakshmi (2007) reports that women workers in southwest India use towels to cover their faces, as protection from the red dusts generated from manganese-containing ore.[196]

Miners also suffer from musculoskeletal disorders such as back pain. This may arise from the impacts of manual lifting of materials, to which women are more vulnerable because of their generally smaller and more fragile frames, when compared to their male counterparts.[200,203] In Uganda, women working as salt miners have been reported to suffer from genital corrosions and miscarriages due to prolonged standing in concentrated saltwater.[197]

Although few studies have characterised injuries in small-scale gold mining communities, the ILO estimates that small-scale mining in low-income countries, which employs large numbers of women and children, generates a workplace fatality rate up to 90 times higher than mines in high-income countries.[194] Physical trauma and miscarriages due to stress and injuries have been cited as risks to women in mining.[196] Studies in the small-scale gold mining region of Tarkwa in Ghana found the most injury-prone mining activities to be related to excavation and crushing. While the overall injury rate was five per 100 person years, the rate for women of 12 per 100 person years was significantly higher.[207]

Other health risks to women and girls that have been attributed to mining activities include sexual violence and abuse, and vulnerability to HIV/AIDS and other STIs.[183, 208] Women and girls may be particularly susceptible, given the inadequate access to sex education, healthcare, and family planning services in many ASGM communities, and the religious and social stigmas surrounding sex and contraceptive use. Because mining communities are predominantly composed of males with disposable incomes, economic factors such as under-employment may encourage women to engage in sex work in exchange for money or for jobs at mining sites, exacerbating the negative impacts of the mining environment on their safety and wellbeing.[163,184,185]

4.2.3 Children's health and safety

The ILO states that a large number of children work in artisanal and small-scale mining.[194] In Papua New Guinea, for example, children provide up to 30% of the labour in small-scale mining.[9] Children are found on the worksites, mainly in the company of their guardians, or driven by poverty, as they often have to fend for themselves. Children and women involved in artisanal and small-scale mining are exposed to similar risks, due mainly to their inherent vulnerabilities. Human Rights Watch, reporting on the problem of child labour in five Tanzanian cities/districts, states that community or family members are exposed to mercury during processing of ore for gold at home, or from eating mercury-contaminated fish from nearby rivers.[208] Most adult and child miners are unaware of the grave health risks associated with exposure to mercury. Girls residing on mining sites, or in close proximity to artisanal and small-scale mining operations, face sexual harassment, including pressure to engage in sex work. As a result, some girls become victims of commercial

Children washing and sorting copper ore in water and mud, at an open-air mine in Kamatanda in Katanga, southeastern Democratic Republic of the Congo

Photograph: Gwenn Dubourthoumieu

sexual exploitation and risk contracting HIV and other STIs. Children who work in mining very often miss out on crucial educational opportunities and experiences.[208]

4.3 Improving working conditions in informal mining

Problems related to work in small-scale mining are primarily the result of its informality: no registers are kept; no taxes are paid; and contacts with, and support from, authorities are rare or non-existent. In low-income countries, the informal economy is populated by marginalised and vulnerable workers. There is a lack of infrastructure and facilities for safety and health. Associated factors that impact on health include job insecurity, lack of health insurance and other social benefits, no affiliation to worker unions or other worker organisations, lack of personal protection, migrant work, increasing numbers of women workers, and child labour.

From a long-term perspective, national development of the economy and society is necessary in order for informal work such as artisanal and small-scale mining to be legalised and formalised, particularly since the informal sector is a major contributor to the economy of many low-income countries. Education in primary and secondary schools has to be expanded and developed. National health systems have to be established or strengthened.

From a short-term perspective, the challenge for government at all levels, policy makers, health and safety professionals, worker organisations, community organisations and other non-governmental agencies, is to develop strategies that are inclusive, appropriate and feasible, with the ultimate objective of protecting informal workers and their dependants.[105,183,209] Priority should be given to improvement of the conditions of vulnerable groups, mainly women and children. Labour inspection should be modernised and more resources should be provided for supervising and supporting work in informal mining. Frequent and substantial training in health and safety should be organised, and consideration given to apprenticeships to help workers understand the hazards and the means of reducing risks, through advice from more experienced workers. Safer mining methods must be introduced, e.g. by promotion of mercury-free gold mining and prohibition of dangerous mining activities such as underwater mining.[210] Prevention of occupational safety and health risks in artisanal and small-scale mining is difficult to achieve, and continued research is needed, along with development, implementation, and sharing of good practices.

The fact that many of the workers in artisanal and small-scale mining are women and children creates special challenges for this sector. Governments, the United Nations (UN) agencies, donors, artisanal miners, gold traders, and companies are called upon to prioritise and fully support the elimination of child labour in an integrated way.[211] Boys and girls should be enabled, encouraged and supported to go to school, and if possible, their families subsidised, to avoid the need for an income from the children. As for women, legal frameworks and development projects should include provision of more environmentally viable and sustainable employment.[105,183] Attention should be paid to women facing disproportionate exposures due to their roles as mothers and home-makers, coupled with those arising from their involvement in mining.[17] Women in artisanal and small-scale mining are known to experience negative impacts on their reproductive health, affecting fertility and/or pregnancy. Future generations are endangered when pregnant women work as miners or are involved in mining-related activities. This makes preventive measures important, especially in the case of women of child-bearing age. Preventive measures include avoiding heavy lifting in late pregnancy, and avoiding close contact with mercury, lead and other metals with health-detrimental effects. Research has shown that brain damage in the foetus hampers early childhood development, in cases where mothers were severely exposed to heavy metals such as mercury and lead during pregnancy.[212]

Several international organisations provide comprehensive guidance on how to study, inform and raise awareness, and improve working conditions in artisanal and small-scale mining. The ILO organises conferences and other types of meetings to disseminate information about the working conditions, and to discuss and implement actions for change. Guidelines exist for the formulation of national employment policies and for the development of inspection manuals for worker safety and health.[15] There are many examples of how to reduce and eliminate child labour in small-scale mining activities, and how cooperation can be established between the ILO's International Programme on the Elimination of Child Labour (IPEC) and local authorities.[17] Activities to address informal mining issues are coordinated and facilitated by the ILO, often in collaboration with other organisations, including the United Nations Environment Programme (UNEP), the Southern African Development Community (SADC), the International Institute for Environment and Development (IIED), and the WHO.

The World Bank offers technical assistance to increase productivity in artisanal and small-scale mining, while also addressing social protection and fair labour standards, for example, within the Bank's programme on 'Communities, Artisanal and Small-Scale Mining' (CASM).[12] The Bank includes mining within a broad effort in local economies to promote better integrated rural development strategies. Pilot efforts are underway to model clean supply chains and fair trade of minerals as a means to spread the principle of responsibility across the supply chain. Additional organisations active in ASGM, considered to be one of the world's top ten pollution problems, include the United Nations Industrial Development Organization (UNIDO), Human Rights Watch, Green Cross, World Business Council for Sustainable Development (WBCSD), and Blacksmith Institute.

Although many organisations are active in terms of working conditions in artisanal and small-scale mining, there is considerable scope for additional action. It is estimated that 20 to 30 million mine workers are involved in informal mining across 80 countries, most of which are low-income countries. The safety and health risks that these workers are exposed to are numerous and serious – for them, their families and the surrounding communities. Infrastructure and facilities for preventive safety and health work are scarce or non-existent.

5. MESSAGE FROM THE ICOH SCIENTIFIC COMMITTEE ON MINING OCCUPATIONAL SAFETY AND HEALTH (SC MINOSH)

The ICOH SC MinOSH is committed to continuing its contributions to addressing risks and implementing sustainable solutions, in both formal and informal mining. The SC MinOSH has established its own website (www.icoh-minosh.com) to include activities and materials relevant to mining. There is a plan to develop a repository of useful publicly available materials and resources, obtained from national and international organisations. As described on the website, the SC MinOSH collaborated with three ICOH Scientific Committees (SCs) (SC Industrial Hygiene, SC Occupational Health and Development, and SC Small-Scale Enterprises and Informal Sector), and with other organisations, to host a conference and workshop on mining in August 2017, with small-scale and large-scale mining tracks. The conference presentations will be made available by webinar, especially for experts and interested parties from low-income nations who are unable to attend the training. The SC MinOSH will continue to establish collaborations with other ICOH SCs, other researchers and stakeholders in large-scale mining, as well as artisanal and small-scale mining. SC MinOSH members will be encouraged to promote the website and to provide extension services for informal mining, and will be engaged in further efforts regarding working conditions and preventive actions in formal and informal mining.

ABBREVIATIONS USED IN PART 3

AIDS	Acquired Immunodeficiency Syndrome
ASGM	Artisanal and small-scale gold mining
CASM	Communities, artisanal and small-scale mining
EPA	Environmental Protection Agency, USA
HIV	Human Immunodeficiency Virus
ICOH	International Commission on Occupational Health
IIED	International Institute for Environment and Development
ILO	International Labour Organization / International Labour Office
IPEC	International Programme on the Elimination of Child Labour
NIHL	Noise-induced hearing loss
SADC	Southern African Development Community
SC MinOSH	Scientific Committee on Mining Occupational Safety and Health
SCs	Scientific Committees
STIs	Sexually-transmitted infections
UN	United Nations
UNDESA	United Nations Department of Economic and Social Affairs
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
US/USA	United States/United States of America
US$	United States Dollars
WBCSD	World Business Council for Sustainable Development
WHO	World Health Organization

Authors' contributions

Kaj Elgstrand: sections 1, 2, 3.1 and 3.7
David Lee Sherson: section 3.2
Erik Jørs: sections 3.2 and 3.3
Claudina Nogueira: section 3.4
Jane Frølund Thomsen: section 3.5
Marilyn Fingerhut: section 3.6
Lage Burström: section 3.8
Hannu Rintamäki: section 3.9
Elias Apud: section 3.10
Esteban Oñate: section 3.10
Nancy Coulson: section 3.11
Leigh McMaster: section 3.11
Edith Essie Clarke: section 4

Reviewers

The draft texts were reviewed by several SC MinOSH members. The most substantial inputs were provided by: Gabriela Gracia, Environmental and Occupational Health, University of Illinois, Chicago, USA; Florencia Harari, Institute of Environmental Health, Karolinska Institute, Stockholm, Sweden; Raúl Harari, Institute for Development of Production and the Work Environment, Quito, Ecuador; Sylvie Nadeau, École de Technologie Supérieure, Montréal, Canada.

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NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH
Division of the National Health Laboratory Service

The NIOH celebrates the first anniversary of its Gender, Health and the World of Work Programme (Gender@Work)

The National Institute for Occupational Health (NIOH) held its second annual event on gender, health and the world of work on 8 March 2017 at the National Health Laboratory Services (NHLS) conference venue in Sandringham, Johannesburg. It was befitting that the first anniversary of NIOH Gender@Work Programme was celebrated on International Womens' Day, as this day commemorates and celebrates working women all over the world.

The NIOH Gender@Work Programme, which is led by Dr Sophia Kisting, aims to address mainstream gender concerns in occupational health and safety in the South African world of work. It also helps to facilitate a greater gender-responsive approach in workplaces by collaborating with role players in different sectors of the economy and in institutions of higher learning. The programme was first launched in 2016 and had previously brought together thought-leaders in the field, such as the International Labour Organization (ILO), the Department of Labour (DoL), the Department of Mineral Resources, the Swedish Workplace HIV/AIDS Programme, the Gender Research Alliance, Gender Links, and the Commission for Gender Equality.

This year, the NIOH Executive Director, Dr Sophia Kisting, and the NHLS Senior Manager of Monitoring and Evaluation (on behalf of the NHLS CEO), Mrs Violet Gabashane, opened the celebrations of the anniversary event. They urged delegates not only to focus on gender issues on designated days like National Womens' Day and International Womens' Day, but to use these days as reminders for the greater cause of decent work and workplace inclusivity for all. Dr Kisting emphasised that, "The issue of gender equality is not for August the 9th, nor is it for March the 8th; it is what we can do every day at each and every workplace to make a difference."

The talks of the day included those by six renowned speakers. The first speaker was Mr Franklin Muchiri, the ILO occupational health and safety (OHS) regional specialist, who presented the results of the 'Perceptions about women and work' ILO-Gallup 2016 Survey which was done in 142 countries with 149 000 participants, both male and female. The results of the survey showed that, in almost all regions of the world, 70% of women would prefer to be working in a paid job and that 66% of men agreed. Universally, both sexes agreed that women were most likely to face challenges balancing work and family life. Lastly, the survey found that, worldwide, the majority of employed women brought in a significant source of their household's income – highlighting the significance of working women as important financial contributors to the family unit.

Mr Muchiri was followed by Dr Asanda Benya who conducted her research on women miners by working underground herself as a miner. Her topic, 'Excluded while included', found that women working underground in the mining industry continued to face various challenges and exclusions due to the masculine work culture in mines. Although some mines have achieved the 10% target of including women in mining, women are still excluded from certain jobs underground, such as rock drilling. Mine staff continue to hold gendered concepts about what jobs women 'should' be performing. Some of the challenges women face are: being excluded from their teams, informal job relocations, inadequate personal protective equipment (PPE), delayed promotions, insufficient training, job insecurity, gender violence, and sexual harassment. The biggest concern is that health and safety matters tend to include only issues that affect mine production. Incidents such as gender violence, sexual harassment, murder and rape are not part of health and safety, meaning that a team can perform well and get bonuses even if some of these incidents occur. Dr Benya concluded that, even though figures from the mines show that women are employed in mines, the mines still have to commit and take the necessary steps to eliminate the challenges that women face to truly realise inclusivity of women in the mining industry.

Ms Vanessa Pillay from WIEGO (Women in Informal Employment: Globalizing and Organizing) followed up on Dr Benya's points to speak on the 'Livelihoods of poor working women versus their health and safety'. She emphasised the importance of health and safety for poor working women because, without adequate OHS measures to protect them, any injury or illness threatens their livelihoods as they often work on a 'no work no pay' basis. She described various health hazards that they face, e.g. lifetime exposures to hazardous substances with little or no choice of alternative employment. She also presented the main appeal for women in the informal economy, namely access to healthcare services where they work, instead of where they live. Most poor working women live far from work in areas where service delivery is poor. Thus, mobile clinics or regular health screening services provided at their places of work would significantly increase their access to healthcare.

After stimulating presentations on the state of women's OHS and the perceptions thereof, Prof. Laetitia Rispel, former head of the School of Public Health at the University of the Witwatersrand, former head of the Gauteng Health Department, and former Executive Director of the Human Sciences Research Council (HSRC), spoke on her experiences of developing female academics in the field of Public Health. She highlighted gender inequality and race issues in the South African higher education sector. She emphasised that women still hold fewer roles and are in lower academic positions than men. She shared her experiences in developing women in academic institutions, where she emphasised the importance of 'value-based leadership' to foster change. She strongly believes that, by providing equitable opportunities, and through the right mentoring and support, equality can be achieved in the academic sector. Prof. Rispel's presentation gave the audience insight into how one can create a meaningful gender-aware change in public health research and policy development by fostering the new generation of female public health academics.

The NIOH Gender@Work committee proudly presented an update from its gender audit process in 2016. The audit was an inclusive and participatory process that involved staff at all levels and taught the committee a critical approach to analysing the organisational internal policies and processes with regard to gender equity. It promoted learning at different levels within the organisation about practically and effectively mainstreaming gender. The audit process also assisted the NIOH to identify organisational gaps and challenges, provided recommendations on the way forward, and suggested possible improvements and innovations. The committee recommended that other organisations undergo a similar gender audit process to align themselves with gender-responsive and inclusive goals.

The presentations were followed by a vigorous panel discussion between trade unions and government departments on the 'Plan and progress for achieving sustainable development goals 3 (health), 5 (gender equality), and 8 (decent work)'. The panel discussion was distinguished by the representation of the Department of Labour, Department of Women (DoW), Department of Public Service and Administration, Hospersa, NACTU, COSATU and Solidarity, and was led in discussion by Redha Ameur, the ILO's HIV/AIDS regional specialist for Africa. The Panel's main conclusions were that, whilst all of the participating bodies were contributing positively in terms of on-going initiatives linked to legal frameworks, and setting the standards for health awareness and law enforcement of OHS, they should engage in a standard (International Organization for Standardization [ISO]) approach to harmonise efforts moving forward.

The discussion highlighted a few challenges and potential next steps, such as to reinforce the synergy and exchange of information between stakeholders, to avoid working in isolation, and to facilitate greater partnerships and collaboration.

The anniversary event exposed audiences to research that highlighted the real struggles women face in the workplace today. The common theme was that many women workers still face the threat of violence on a daily basis. However, the presentations gave insight into how perceptions of women entering the workplace are shifting to become more gender responsive and inclusive, as well as how we can include women in the OHS dialogue. Examples of grassroots interventions were presented that resulted in positive and effective outcomes.

In conclusion, all attendees and delegates agreed that gender equity policies and workplace cultures need to be prioritised every day, not only during Women's Month or on International Womens' Day. The emphasis, moving forward, should lie on collaborative and synergistic efforts to enhance the impact of our initiatives.

The NIOH sincerely wishes that the dialogue around gender will continue after being fuelled by the Gender@Work Programme. The NIOH also wholeheartedly thanks all who participated in this year's anniversary event and looks forward to continued interaction between any new and old stakeholders.

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Dr Sophia Kisting, NIOH Executive Director, speaking at the NIOH Gender@Work Programme first anniversary

Photograph: Guy Hall

Mr Franklin Muchiri, ILO OHS Regional Specialist, and Dr Sophia Kisting, NIOH Executive Director, at the NIOH Gender@Work first anniversary

Photograph: Guy Hall

The Panel (from L to R): Redha Ameur (ILO), Sipho Senabe (DPSA), Tibor Szana (DoL), Nombulelo Msikinya (DoW), Fazeela Fayers (HOSPERSA), Paulina Nkosi (NACTU), Zingiswa Losi (COSATU), Jahni de Villiers (Solidarity)

Photograph: Guy Hall

Report by:

Samantha Jack, NIOH, e-mail: samantha.jack@nioh.nhls.ac.za

Trudie Vorster, NIOH and University of Johannesburg, e-mail: trudie.vorster@nioh.nhls.ac.za

Nonhlanhla Tlotleng, NIOH, e-mail: nonhlanhla.tlotleng@nioh.nhls.ac.za

Talifhani Ramaliba, NIOH, e-mail: talifhani.ramaliba@nioh.nhls.ac.za

Babalwa Nqini, NIOH, e-mail: babalwa.nqini@nioh.nhls.ac.za

Nosimilo Mlangeni, NIOH, e-mail: nosimilo.mlangeni@nioh.nhls.ac.za

NATIONAL INSTITUTE FOR OCCUPATIONAL HEALTH
Division of the National Health Laboratory Service

Construction and health

A summary report on the inaugural NIOH 'Occupational health and decent work for the construction industry' workshop

The National Institute for Occupational Health (NIOH), a division of the National Health Laboratory Service (NHLS), held a workshop on occupational health and decent work for the construction industry on 23 March 2017 in Johannesburg. Delegates at the workshop included NIOH staff, construction industry tripartite plus stakeholders (government, trade unions, employer organisations, and civil society), the International Labour Organization (ILO), academics, and occupational and environmental health and safety (OEHS) professionals.

There are over 100 million documented construction workers globally,[1] and at least 1.5 million construction workers in South Africa. The construction industry contributed about 4% of the gross domestic product (GDP) in 2016.[2,3] The industry is one of the three industries with the highest work-related injury risk.[4] Construction work is associated with traumatic injury, poor ergonomics, and chemical, physical, biological, and psychosocial hazards. These hazards can cause occupational and work-related diseases.[5]

The construction industry provides a traditional point of entry into the labour market for rural-urban workers, and is often the only significant alternative for the poorly educated person, with no skills, and for landless, migrant and vulnerable workers.[2] In most countries, construction jobs are undertaken almost exclusively by men, with women performing unskilled tasks for very low pay. This leads to inherent gender bias due to male dominance attributed to the nature of the work and unfavourable working conditions.[6]

The Occupational Health and Safety Act (OHS Act) no. 85 of 1993, and its Construction Regulations 2014, place obligations on employers to ensure the health and safety of construction workers.[7] To this end, NIOH hosted a national workshop intended to be a platform for knowledge sharing and discussions that would pave a way for the protection, promotion, maintenance and improvement of construction workers' occupational and environmental health safety (OEHS).

The objectives of the workshop were:

- To outline the relevant OEHS legal and legislative framework for the prevention of occupational diseases
- To highlight the burden of occupational diseases
- To discuss the provision of preventive OEHS services, including occupational risk assessment and medical surveillance, while emphasising a gender-inclusive and ethical approach
- To discuss challenges and opportunities to nurture prevention strategies in OEHS for occupational diseases

The NIOH Executive Director, Dr Sophia Kisting, opened the workshop and introduced its purpose. She acknowledged the burden of safety and occupational injuries but highlighted occupational health and occupational diseases as the focus of the workshop. She spoke about the role of OEHS in the protection of human rights at work; OEHS as an integral part of public health; social determinants of health and OEHS and the importance of OEHS as a key social determinant of health; the need to nurture a culture of sustainable prevention while embracing the Sustainable Development Goals; and the importance of risk and exposure assessment and risk management in OEHS.

Mr Phumudzo Maphaha from the Department of Labour (DoL) provided an outline of relevant policies and legislation, and highlighted the dire shortage of qualified health and safety professionals, particularly inspectors, which hampers enforcement. He further elaborated on the OHS Act and the Construction Regulations 2014, and related enforcement matters; provided valuable information on the availability of OEHS data and its utilisation; emphasised the importance of proper qualifications for health and safety officers, and of factoring in OEHS at the design phase of the construction project with a dedicated budget; and concluded by saying that "The dangerous conditions of work currently prevailing in the construction industry are tantamount to modern day slavery".

Mr Frank Muchiri (ILO) spoke on the application of ILO standards. He emphasised the need for development of a preventive occupational health and safety (OHS) culture and the application of a systems approach to managing OHS at the national level. He noted that this was achievable through three foundational concepts: the national OHS policy, a national OHS system, and a national OHS programme.

Professor David Rees (NIOH) presented a paper on the burden of work-related disease in construction. He outlined exposures and associated diseases in the construction industry, and reported on availability of data and data sources globally while acknowledging the paucity of data in South Africa. He emphasised, though, that 'if you seek you shall find' data!

Mr Ashraf Ryklief of the Industrial Health Research Group facilitated a tripartite panel discussion with

Participants networking, from L to R: Derk Bouwer (Wits), John Smallwood (NMMU) and Mohamed Jeebhay (UCT)

NIOH Executive Director, Sophia Kisting (right), networking with Claire Deacon (OEHS expert)

Tripartite panel discussion, from L to R: Ashraf Ryklief, Phumudzo Maphaha, Itumeleng Leshoedi, Tumi Moagi and Mziwakhe Nhlapo

representatives from DoL (Mr Maphaha), Master Builders South Africa/Business Unity South Africa (Ms Leshoedi), Black Business Council (Mr Moagi), and COSATU/NUM (Mr Nhlapo). The discussions focused on the different OEHS roles of the tripartite stakeholders and how each stakeholder contributed to the OEHS of construction workers.

Finally, group discussions were held with delegates divided into three groups, focusing on: 1) leadership, governance and service delivery; 2) health information and research; and 3) human resources, financing and technology. Overall, the discussions noted the importance of increased enforcement capacity; empowering workers; tracking workers to capture the extent of occupational disease and injuries; conducting collective research; analysing OEHS training; and developing a central database for surveillance data.

In closing, Dr Kisting committed NIOH to act as a catalyst moving forward, while Dr Muzimkhulu Zungu (NIOH) stated that the workshop brought stakeholders together and opened social dialogue on OEHS for the construction industry which has identified opportunities and threats, thus marking the beginning of engagements towards strengthening OEHS in the construction industry.

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Report by:
Muzimkhulu Zungu
NIOH: Head of HIV and TB in the workplace
Coordinator – OEHS in the construction industry
e-mail: muzimkhulu.zungu@nioh.nhls.ac.za
Nosimilo Mlangeni
NIOH: Public Health Practitioner HIV and TB in the workplace
e-mail: Nosimilo.Mlangeni@nhls.ac.za

Documenting the story of asbestos

A HISTORY OF ASBESTOS MINING IN SOUTH AFRICA

By Piet van Zyl

The purpose of this book was to document hitherto untold accounts of asbestos mining in South Africa, based on the unique life of the author. He was heavily involved in asbestos mining, starting out as a clerk in his youth and gradually moving up to senior management before becoming a trustee of the Asbestos Relief Trust. From his involvement in the industry, he was able to access large amounts of information from former asbestos producers. There are few books specifically on asbestos mining in South Africa, and include *Asbestos Blues: Labour, Capital, Physicians and the State in South Africa* by Jock McCulloch, and *Post Asbestos Mining Environment, Limpopo Province, South Africa* by Gift Muzi Matsabatsa.

This insider's history will clearly be useful – thanks go to the author for his years of research and effort in putting this album together, of contemporaneous opinions and impressions, photos, extracts and facts never previously made public. It is a pot pourri of a fractured mining story, covering more than a century and all the major asbestos fields, from the blue asbestos hills in the Northern Cape (Prieska, Kuruman and Pomfret) to the brown (Penge) and white (Msauli) deposits found in the north-east of the country. The first reports of asbestos were from 1805 and the last mines closed in 1992 for brown amosite, in 1997 for blue crocidolite, and in 2001 for white chrysotile.

The book is divided into three sections, each focusing on a different type of asbestos – Cape blue asbestos (crocidolite), amosite and chrysotile. These divisions are, however, hard to find, not employing cues usually expected, like super-large fonts, or blank preceding pages. Crocidolite occupies around half the book, and amosite and chrysotile the balance. The pages follow a non-comprehensive pattern, with the pedestrian vein of time holding the history. As a result, it could seem unintelligibly dry to the casual reader, but will be of great interest to industry and related cognoscenti.

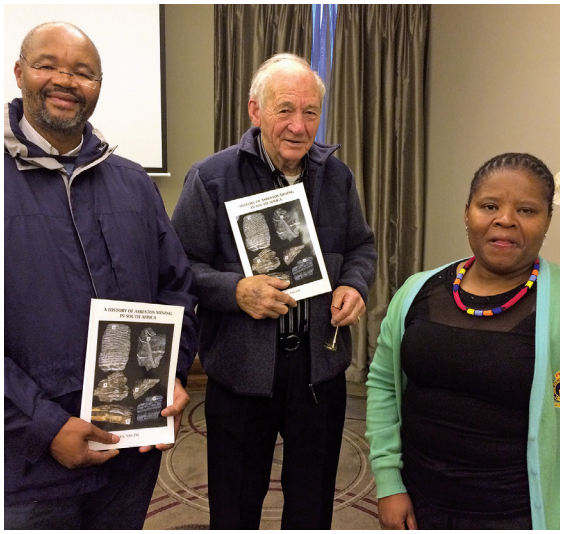
Better organisation, as well as stronger and modern editing would be welcome. The presentation could, for example, have paid more attention to captions describing the many informative photographs, or have included a glossary of mining terms, machinery, names of jobs and short descriptions thereof. There are occasional paragraphs where a non-common mining term or idiom is both mentioned and described, but a consolidated listing of such terms would have been useful.

"The colonial and patriarchal lens through which operations and workers were viewed comes through clearly in the language used and/or cited in the book which, while possibly historically accurate, is unfamiliar to the modern reader, who is left to recognise the context without editorial comment."

The book is a monologue without academic referencing, and will prove interesting to insiders already involved in this field. It might find its niche and best use as an occasional reference, the reader having already become familiar with its content after an initial light read-through. The book, unfortunately, misses being authoritative, and lacks maps and a subject index. It does, however, have a table near the end which provides the GPS positions of the many asbestos mines, plus a useful index of the various main characters in this history.

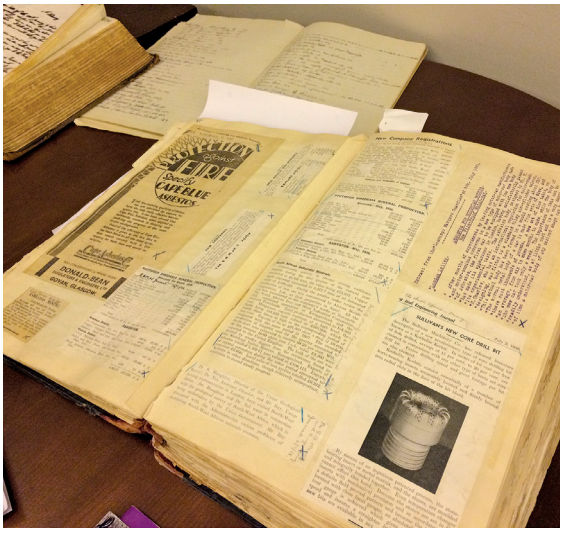
This work will find a useful place on the bookshelves of those many characters who have worked in asbestos mining or in its sequelae.

Review by: Amira Wallace and Jim teWaterNaudé



Asbestos Relief Trustees, from L to R: Connie Molusi, Piet van Zyl (the author) and Dr Lady Jood

Photograph: Gill Nelson



A selection of the extensive archival material used by the author

Photograph: Gill Nelson

The interested audience, including (at near left) Richard Spoor, the lawyer who set up the Asbestos Relief Trust in 2003

Photograph: Gill Nelson

Welcome to training with Momentum OCSA's Academy of Excellence

OCSA is a name that is well known for quality and high standards, well respected for expert knowledge and well-loved because of our team's commitment and integrity across the country. Very simply, The Academy of Excellence (AoE) is Momentum OCSA's training division offering educational solutions in workplace health, wellness and safety.

WE KNOW WHAT WE WANT

The AoE is all about progress with purpose. We want to reach and empower health professionals in South Africa through distance and e-learning. But we don't stop here – we do this on the African continent too. With over two decades of experience in education, and a highly qualified multi-disciplinary team of professionals to call upon, we are known for our capability to customise any learning experience. We strive to be innovative and dynamic, we are committed to excellence and we're passionate about health and education. Our ultimate goal is to deliver a solution to our unique set of African health and safety challenges by using customised education and training products in occupational and primary wellness and occupational health and safety.

LOCATE YOUR TRAINING – WE GET AROUND!

Pre-scheduled training is offered at Momentum OCSA branches nationwide: Alberton, Cape Town, Durban, Port Elizabeth and Mpumalanga. In addition, training is facilitated for groups across the African continent in any location.

GOING SOLO – TRAINING FOR INDIVIDUALS

Our flagship course is the SANC approved Diploma in Occupational Health Nursing Science. Known for our standards of excellence, this course will prepare any learner for success in the occupational health arena because our lecturers are subject matter experts with loads of practical experience.

We also offer a variety of pre-scheduled standalone short courses and workshops, all of which are mapped against the most recent legislation, Unit Standards and guideline documents.

BUNDLING UP – TRAINING FOR LARGE ORGANISATIONS

We offer "company bundles" where our clients can choose a number of tailored training sessions for the year, based on the specific needs of their organisation and healthcare professionals. These can be pre-scheduled at one of our nationwide branches or done on-site at the client's premises. Contact Lindsay Zurba at lindsay@ocsa.co.za or 031 502 3256.

HOME FROM HOME – TRAINING FOR INTERNATIONAL LEARNERS

At the AoE we go the extra mile to support international learners. Ask about our all-inclusive International Learners Training Package, which enables each learner to experience peace of mind on a personal level and covers all ancillary arrangements. We believe this formula creates the best possible chance of success in the academic arena for learners in possibly unfamiliar territory away from home.

EXPANDING ALL THE TIME

Our portfolio of highly acclaimed Advanced Certificates are being updated and expanded continually. These long distance blended and e-learning courses in Primary Healthcare, Chronic Disease Management and Wellness are offered at all NQF levels, including Diploma level.

We enjoy interaction with the people who really count – the ones who are interested in our training – or those who have trained with us. Please feel free to offer your suggestions for expanding our portfolio to suit your needs – your thoughts are most welcome.

African countries where OCSA courses are already facilitated

FINAL WORD

As you can see, we are actively engaged in promoting and conducting several workshops and short courses at any one time. Diverse disciplines of health and safety are covered, each of which requires individual thought and attention. Fortunately we are bold enough to say that this is an area we are particularly geared to provide and well able to supply. We have certainly worked hard for over 22 years to earn our reputation as a trusted market leader.

That said – we look forward to hosting you on a Momentum OCSA training course very soon!

Contact us at +27 (0)11 803 3538,
e-mail:marketing@ocsa.co.za; www.ocsa.co.za

Report from the SAIOH President and Council Members

SAIOH AWARDED ACCREDITATION AS AN EXAMINING BODY FOR 'OHTA W201 – BASIC PRINCIPLES OF OCCUPATIONAL HYGIENE'

It is with great pleasure that the Southern African Institute for Occupational Hygiene (SAIOH) Council and Professional Certification Committee (PCC) announce that that SAIOH has now been formally awarded accreditation to act as an examiner for the 'W201 – Basic principles of occupational hygiene' module of the Occupational Hygiene Training Association (OHTA). This is a remarkable opportunity for SAIOH, its administrators and the members of the PCC to show that SAIOH can successfully run the examinations according to OHTA requirements, with strict quality assurance and the high standard of SAIOH's questions and model answers. Any southern African-based Approved Training Provider (ATP) may now order the required examination papers at a greatly reduced price, directly from the PCC administrator.

Introduction of recognised proficiency training in asbestos-related work in South Africa

Ms Julie Hills, registered occupational hygienist (ROH) and SAIOH Vice President 2017, has received accreditation from the British Occupational Hygiene Society (BOHS) to teach the modules related to asbestos work, as part of her involvement in the development of a South African-based asbestos counting proficiency scheme. The first module which will be offered to occupational hygienists in southern Africa is 'IP403 – Counting of asbestos fibres', which will be followed, in due course, by three modules: 'IP402 - Surveying and sampling strategies for asbestos in buildings'; 'IP404 - Air monitoring, clearance inspections and reoccupation following the removal of asbestos'; and 'IP405 - Management of asbestos in buildings'. In the UK, these four modules build into an advanced qualification where occupational hygiene practitioners can eventually attain registration as certified asbestos analysts (CAAs). Since each module greatly elevates the knowledge and practice in all aspects of asbestos management and analysis, it is anticipated that the introduction of this type of training will contribute substantially to capacity and skills building in asbestos proficiency counting in the southern African region, at a competitive cost.

SAIOH MOVERS AND SHAKERS IN THE WESTERN CAPE

• Collaboration with sister organisations SASOM and SASOHN

The SAIOH Western Cape Branch had a great start to the year by having collaborations with both the South African Society of Occupational Medicine (SASOM) and the South African Society of Occupational Health Nursing Practitioners (SASOHN).

At the first branch meeting of the year, on 10 March 2017, Dr Greg Kew (Chairperson: SASOM Western Cape chapter) gave an interesting lecture on lethal dose (LD 50), lethal concentration (LC 50), and dose response curves. Dr Kew was handed the SAIOH Personal Learning Portfolio (PLP) Section 6 which deals with toxicology. Hopefully, the SAIOH members will be able to complete this section with flying colours!

Ms Celia Keet, Chair of the SAIOH Western Cape Branch

Figure 1. The winning team members each won a R500 Spur gift voucher donated by Occupational Hygiene Monitoring Services (Pty) Ltd (OHMS). L to R: Ian Nortie, Fanie Kruger, Celia Keet (quiz master) and Trevor Kapp

Photograph: Celia Keet and the SAIOH Western Cape Branch

Figure 2. The second place team members each won a bottle of wine donated by EXCO Services. L to R: Gerard Keet, Pierre Wepener, Vuyiseka Zikolo and Celia Keet (quiz master)

Photograph: Celia Keet and the SAIOH Western Cape Branch

and ROH, was invited to participate in an expert panel to discuss a case study for the SASOHN Academic Day, on 18 May 2017. The Panel consisted of Milly Ruiters (Department of Labour), Drs A Burdzick and Hannelie de Wet (occupational medicine practitioners [OMPs]), Karen Michell (occupational health practitioner [OHP]), and the panel facilitator, Angie Butkovic (OHP: Wits University). The case study was based on a company that did not think that occupational hygiene surveys were required, as these had been carried out four years previously. Understandably, the company's OHP was very frustrated and on the verge of resigning; hence, she required expert assistance in advising company management. The panel of experts was able to put forward a convincing case in terms of the necessity of occupational hygiene surveys, and why these should be conducted on an ongoing basis. The case study was presented in such a way that other organisations can use it for learning purposes.

Following the presentation of a case study, a panel of experts was nominated. They reviewed the available information and commented on the legal aspects of the case. The audience members learned from the Panel. On completion of the case study presentation, the audience had learnt where to find the required information and legislation on occupational hygiene surveys, and the consequences of non-compliance. As a bonus, SAIOH members who attended the discussion were eligible to claim Continual Professional Development (CPD) points. The presentation of a case study such as this can be arranged to coincide with SAIOH branch meetings, to take advantage of the availability of members, and is an added benefit to members in terms of their professional development.

• SAIOH occupational hygiene quiz event

On 10 June 2017, the SAIOH Western Cape Branch held an occupational hygiene quiz at the Melkbosstrand Cricket Club Sports Bar, after the SAIOH meeting. The 27 participants were divided into nine teams of three people, ensuring that each group had at least one ROH. Celia Keet, the quiz master, read out the questions with the aid of PowerPoint, and Hennie van der Westhuizen, SAIOH Council member responsible for the technical portfolio, kept score. The teams were all beyond enthusiastic, and the activity turned out to be very amusing and loads of fun, to say the least! The event got off to a wobbly start, as team members raised their hands to indicate they knew the answers to questions, and the first team to raise hands got to answer the question. Very quickly, this idea was put aside, as hands went up before the questions were even read. The next approach was for the team leader to shout out his or her name, and the first person to shout was chosen to answer the question. This too turned into an hysterical cheating session so, very quickly, Melinda Bezuidenhout was extracted from her team to become a spotter, and it was back to the business of raising hands.

The questions were asked and the answers came flying. One team leader was convinced that his team was being ignored, as they had put up their hands first every time. The adjudicators did not fall for this ploy. Another team leader was more concerned about when there would be more beer and wine to help relax his team's minds, so that they could answer more questions, faster. At one stage, it was touch and go, as the quiz master, score keeper and spotter all thought they would surely be overthrown, and the participants would elect new adjudicators.

In total, there were 45 questions; some were related to all-things SAIOH, others to occupational hygiene stresses, and there were a few fun questions thrown in for good measure. The score keeper, Hennie van der Westhuizen, often expanded on the answers, selflessly sharing his extensive knowledge and insight into occupational hygiene for the benefit of the participants.

Questions included:

- *Explain your understanding of the term 'dose', by way of an equation.*
- *Who shot John F Kennedy?*
- *Which of the following has the correct units for measuring vibration?*
  - m/s
  - m/s^{-2}
  - m/s^{2}
  - m/s^{3}
- *Sir Percival Pott is associated with:*
  - welding fume fever
  - particulate induced emphysema
  - scrotal cancer
  - hashish
- *The pneumoconiosis caused by iron particles inhaled from, e.g. welding fumes, is known as:*
  - Siderosis
  - Rustosis
  - Ironosis
  - Halitosis
- *Who is the SAIOH President?*
  - Kenneth Hlungwane
  - Richard Mdlalose
  - Norman Khoza
  - Jaco Pieterse

A Spur gift voucher was awarded to each member of the winning team, and a bottle of wine to each member of the second place team. The third place team members (Christia Steynberg, Linri Bendle and Chris Lodus) each won a goody bag sponsored by 3M.

All in all, not only was the quiz a lot of fun and full of laughter, it was also an excellent team-building session and a valuable learning opportunity. The SAIOH Western Cape Branch will certainly hold more quiz events in the future, and challenges the other SAIOH branches to do the same.

REFRESHER: IMPORTANT ANNOUNCEMENT REGARDING YOUR SAIOH PERSONAL LEARNING PORTFOLIO (PLP)

The SAIOH Council and PCC would like to remind all members that the keeping of a PLP becomes mandatory from the end of 2017. The recent CPD audit and problems associated with completing this successfully identified the need for a more stringent method to keep evidence relating to career development and associated activities, for which members claim CPD points. Whilst this might seem to be another time-consuming activity, members who have started using this process confirm that, in the long term, the PLP saves time and is a strong evidential document to support their CVs and job applications, as well as the CPD process. Approved Inspection Authorities (AIAs) that have implemented this for their staff confirm that it is a good way to keep evidence of training and development of their staff, and that it supports the SANS 17020 accreditation system. Please read the SAIOH guide to your PLP, available on the SAIOH website, to understand the concept and the requirements. All applications, requests for upgrades, and CPD audits going forward will request copies of your PLP as part of the process.

Figure 3. Ian Nortie explaining the physiology of the ear, as part of the answer to a quiz question

Photograph: Celia Keet and the SAIOH Western Cape Branch

SAIOH fast facts: SAIOH membership by category, gender and location (July 2017)

Occupational Hygiene Category	Female		Male	
	n	%	n	%
Occupational Hygiene Assistant (OHA)				
South Africa	290	53	261	47
Botswana	3		5	
Namibia	1		3	
Tanzania	0		1	
Occupational Hygiene Technologist (OHT)				
South Africa	87	43	114	57
Botswana	3		3	
Namibia	2		1	
Australia	0		1	
New Zealand	1		0	
Occupational Hygienist (OH)				
South Africa	50	26	141	74
Botswana	1		0	
Namibia	0		2	
United States of America	0		1	
Sub-total	**438**	**45**	**533**	**55**
In addition to the above, there is another category which is growing substantially:				
Registered Occupational Hygiene Assistant (Student)				
South Africa	54	68	25	32
Total SAIOH membership	**492**	**47**	**558**	**53**

Report by:
Kenneth Hlungwane,
SAIOH President 2017
e-mail: saiohpresident@saioh.co.za
Julie Hills,
SAIOH Vice President and Treasurer 2017
e-mail: julieh@saioh.co.za
Celia Keet,
Chair of the SAIOH Western Cape Branch
e-mail: celia@ohmservices.co.za
Kate Smart,
SAIOH Chief Administrative Officer
e-mail: info@saioh.co.za
Claudina Nogueira,
SAIOH Council Member
Portfolios: Liaison and Communication & Marketing
e-mail: claudinan@saioh.co.za

SASOHN Western Cape celebrates Occupational Health Month

The Western Cape (WC) Branch of the South African Society of Occupational Health Nursing Practitioners (SASOHN) was privileged to host three events in the Western Cape during May 2017.

The first important event, held on 3 May 2017, recognised Occupational Health Week, of which the objectives are: to integrate health and safety into overall business goals and objectives; to create awareness and improve relationships with management to increase health and safety in the workplace for productivity and economic development; and to provide information and knowledge regarding the role of the occupational health nurse practitioner (OHNP) within the workplace.

The SASOHN WC 'Managers Breakfast', sponsored by Consol Glass at their Bellville premises, was well attended by SASOHN members and their managers. Dr Terry Berelowitz, an occupational medical practitioner, who organised the Occupational Health Week in South Africa in the early 1990s, was our guest speaker. He painted an inspiring picture of the OHNP as a company's greatest asset, in that the OHNP's diverse expertise, acquired not only through learning but also by experience on the factory floor, makes occupational health a unique specialisation in nursing. In addition, OHNPs add value, not only to the companies where they work, but also to the lives of the workers and their families, beyond the factory gates.

International Nurses Day was the next prestigious event celebrated on 12 May in Blouberg, with members overlooking beautiful Table Bay while enjoying a sumptuous breakfast. The event was generously sponsored by Pathcare who also provided the guest speaker, Dr Younus Essack, who gave a fascinating talk entitled 'Putting the "U" in Urine Analysis'. Urine analysis is one of the most basic tests nurses perform on a daily basis as a routine part of the health surveillance programme. Yet one tends to forget the valuable information that can be gleaned from this test. On humorous reflection, the topic was co-incidentally presented at the Blue 'PEE' ter Hotel. With rejuvenated enthusiasm, all members, students and honorary life members present renewed their commitment to our caring profession with the Nurses' Pledge of Service. After breakfast, the nurses working at Sivuyile Centre for people with disabilities, and Miles Bowker House for people with psychiatric conditions, were recognised for their dedication to the noble profession of nursing through gift pens and fancy biscuits, sponsored by SASOHN WC. SASOHN WC continues to support these facilities as part of the social responsibility outreach programme. The afternoon followed with a visit to the nurse residents of Clarence House, where residents were treated to decadent cupcakes. Clarence House is a home for retired nurses, and Jenny Upton, the founder of the Theatre Nurses Society, is one of the many residents.

Last, but not least, SASOHN WC also hosted the 12th Academic Day in Cape Town at the Town House Hotel on 19 May, with the theme, 'Norms and standards in occupational health'. Delegates from the Scientific Committee on Occupational Health Nursing provided the event with an international flavour. The activities of this day were reported in an earlier issue of the Journal. As always, SASOHN WC received the support of service providers in the occupational health sector. Our sincere thanks go to Medisa for sponsoring delegates' gift bags. Other exhibitors included Amtronix, Momentum OCSA, Onsite X-rays, Ampath, Image Makers, Lancet Laboratories, Endomed, Homemed, Prismia, SSEM Mthembu and The Paramedic Shop. To top off the experience, Hands-On-Therapy boosted delegates' moods and energy with neck and shoulder massages.

Thank you all for making these events a success.

MANDELA DAY AT THANDI HOUSE

Thandi House is a faith-based, long-term, family home administered and managed by Mark and Rene Morcom. It is situated on the north side of Pietermaritzburg and has the objective of caring for the broken and forgotten children of the town, giving them the love and family that every individual deserves. The facility cares for as many as 25 children, and includes young girls coping with unplanned pregnancies. Thandi House opened its doors in 2009 after a large number of new-born babies were found dead in trash cans, gutters, fields and public toilets. One of the interventions was the installation of a baby box (a computerised box installed in a church wall) which has created a legal and safe way to abandon an unwanted baby without harming the baby. The box has provided a safe option to desperate mothers, and has reduced the number of abandoned babies to almost nil currently. Thandi House is a non-profit, tax exempt charity in South Africa, operating under the name ASSIST, with no financial assistance from government (www.thandihouse.com).

This year, the SASOHN Executive pledged, as part of SASOHN's social responsibility initiatives, to donate all funds used for Polly-anna gifts to this charity. A total of R2 000 was collected and handed over to SASOHN KZN Inland to purchase groceries and consumables for the facility. In the photograph, Mark, Rene and their son are seen receiving the donation on behalf of Thandi House. A sincere thank you is extended to all for their generous contributions towards this worthy cause!

Report by:
SASOHN Western Cape Committee 2017
and Morag Roberts, Chairperson of SASOHN KZN Inland
e-mail: morag.roberts@sappi.com

SASOHN WC celebrating International Nurses Day at Clarens House for retired nurses in May 2017
Photograph: supplied by SASOHN WC

Mark, Rene and Joshua Morcom unpacking the groceries at Thandi House
Photograph: by Sr Morag Roberts

SASOM news

From L to R: Ms Claudina Nogueira (SASOM and SAIOH), Mr Deon Jansen van Vuuren (SAIOH), Ms Angie Butkovic (SASOHN), Dr Thomas Fuller (guest presenter from the USA), Ms Karen Michell (SASOHN), Dr Jenny Sapire (SASOM Secretary), Prof. Daan Kocks (SASOM Chair), Ms Milly Ruiters (DoL), and Ms Alta Kruger (SASOHN)
Photograph: Duschanka Hitzeroth

Occupational health practitioners have benefitted from the number of SASOM academic meetings and seminars in recent months.

First, the Wits School of Public Health hosted a seminar on 17 July 2017 with two presentations by Dr Thomas Fuller, an Associate Professor of the Safety Programme of Illinois State University, USA. The event was supported by the Southern African Institute for Occupational Hygiene (SAIOH), the South African Society of Occupational Health Nursing Practitioners (SASOHN), and the South African Society of Occupational Medicine (SASOM). SAIOH and SASOM sponsored the snacks and lunch that was served to the 80 delegates after the event.

For a comprehensive report on this seminar, access the *Occupational Health Southern Africa* website (www.occhealth.co.za).

Dr Fuller's first presentation, entitled 'Global issues in occupational safety and health', highlighted the need for qualified occupational safety and health practitioners to address the growing challenges of survival and sustainability of enterprises and of nations. In his second presentation, 'Innovations in industrial hygiene approaches to infection control', he discussed new methods of air and surface monitoring, advances in personal protective devices, and improvements in hospital ventilation. Go to the link http://www.sasom.org/2017/07/17/industrial-hygiene-innovations-in-infection-control/ in the SASOM website to access this presentation.

The programme was accredited with two clinical continuing professional development (CPD) points by the South African Medical Association (SAMA), and CPD certificates were issued to the delegates.

Second, Dr CL Carstens, Chairman of the SASOM Port Elizabeth Branch, arranged an academic evening on 1 August 2017. The programme included a presentation on the 'Baobab Process' which is an outpatient alternative to substance abuse treatment, by Mr Konrad van Staden, and was accredited for one Clinical CPD point. We thank Sulene Nel who sponsored the event.

Third, on 16 August 2017, an academic meeting preceded the SASOM Northern Cape Annual General Meeting at the Red Sands Lodge near Kuruman. In the academic programme, Prof. Daan Kocks discussed occupational health services as defined by SASOM and SASOHN, while Prof. Gill Nelson explained the pitfalls of plagiarism and how and why to avoid it. Dr Michel Muteba reported on trends in mesothelioma deaths gained from four different data repositories in South Africa for the period 2003-2013. Last, Dr Jim teWaterNaudé explained the reading of digital chest X-rays and how these differ from analogue readings. SAMA awarded two clinical CPD points to the attendees.

SASOM ANNUAL GENERAL MEETING AND CONFERENCE

The SASOM Annual General Meeting will take place on 25 November 2017 at the Coastlands Hotel in Umhlanga. The AGM will be preceded by an interesting conference organised by the SASOM KwaZulu-Natal Chapter. The preliminary programme includes presentations on:

- Challenges of workplace absenteeism, by ICAS.
- Management of absenteeism and 'sick certificates', by Dr Jan Lapere (SASOM).
- Fitness to work with food allergens, by Prof. Mohamed Jeebhay (UCT).
- Greener workplaces for a greener environment, by Dr Sophia Kisting (NIOH).
- Key issues on the design and implementation of a substance abuse programme, by Dr Greg Kew (SASOM).
- Update on the Compensation Fund and the latest legislative changes by the Department of Labour, by Ms Milly Ruiters.
- The updated SASOM Guideline on Medical Requirements for Fitness to Drive, by Dr Greg Kew.

SASOM will apply for accreditation of six clinical and two ethics CPD points for the conference programme.

SASOM appreciates the contribution to the report by Ms Claudina Nogueira.

Report by:
Jenny Acutt
SASOM National Office
e-mail: info@sasom.org

Dr Nothando Moyo-Mubayiwa appointed as President and Dr Muofe Murwamphida appointed as Vice President of the MMPA

Dr Nothando Moyo-Mubayiwa, newly appointed President of the MMPA, holds a Bachelor's Degree in Medicine and Surgery (Cum Laude) and a Postgraduate Diploma in Occupational Medicine and Health from the University of Pretoria. She is a certified independent medical examiner with the American Board of Independent Examiners. Dr Moyo-Mubayiwa currently chairs the Northern Cape Mine Managers Association's Wellness and Behaviour Committee which prides itself in sharing and adopting best practice in the health and wellness arena among the mines in the Northern Cape.

Dr Nothando Moyo-Mubayiwa

Dr Muofhe Murwamphida

In her own words:

"My story began back in the Medical University of Southern Africa (University of Limpopo), better known as Medunsa back then. My dream had been to become a doctor as long as I can remember. I spent my internship year in Kroonstad Boitumelo Hospital where I fell in love with emergency medicine and surgery, as the medical officers would make sure we could do all sorts of surgeries so that we would not have to call them out to assist. That was a memorable part of my formative years as a doctor. After a couple of years as an emergency medical officer at Helen Joseph, nicknamed "Hell in Joburg" as it was such a busy hospital, I decided I had had enough of the adrenaline rush of each "resus" and opted to study occupational health, being fascinated by the issue of health in the workplace. I joined EOH Health and managed the Standard Bank Primary Health Care Clinic. During this period, I conducted executive medicals, and ran the occupational and health services. I also assisted with incapacity and disability decisions, and setting up the Standard Bank Rosebank employee wellness centre."

Dr Moyo-Mubayiwa currently works at Kumba Iron Ore's Sishen Mine in the Northern Cape, a role she has held since 2014. She provides strategic leadership for the Occupational Health and Hygiene Services at the mine, and ensures adherence to all legal and ethical acts and regulations, as well as medico-legal and corporate governance requirements. In her role at Kumba Iron Ore, she has gained vast experience in occupational health and safety, medical incapacity and disability management, and project management.

"I moved with my family to join Kumba Iron Ore Sishen Mine in Kathu. This was a big move for us going to live in the Kalahari, a part of the country we had never been to. I moved through the ranks to Superintendent Occupational Health and Hygiene. I love the challenge that comes with working for one of South Africa's largest mines. It is always rewarding to change mindsets and see people change their idea of healthy living one step at a time."

"Since January 2017 I have been tasked with heading up the Northern Cape Mine Managers Association Tripartite Wellness and Behaviour Work stream. It is great working together and learning from each other as wellness champions as we move through the journey towards zero harm. One life lost or harmed in our mines is one too many."6

"In June 2017 I was elected as the President for Mining Medical Professionals Association (MMPA). This was a huge honour for me. MMPA seeks to raise the profile of medicine in mining, something which I have become very passionate about. The organisation's mission is to remain an integral and indispensable discipline in the mining industry by promoting best practice in mine medicine and productivity of the workforce."

Dr Moyo-Mubayiwa describes herself as a well-rounded medical professional with several years' experience in occupational health, who loves working with people and thrives on challenges and operating under pressure. A key theme of her life is balance in her personal and professional life.

"I am very passionate about healthy living and keeping fit. I recently started a running initiative in the community. Every Saturday morning we have a 5-km run in the spirit of being fit for life and fit for work. The first ever Kathu parkrun will be opened by the Comrades marathon legend, Bruce Fordyce, on the 23rd of September 2017. The Kathu parkrun is one little step in ensuring that the community at large gets up and moves towards a healthy lifestyle."

Dr Muofhe Murwamphida, the new Vice President of the MMPA, holds a Bachelor's Degree in Medicine and Surgery (Cum Laude) from the University of KwaZulu-Natal (UKZN), and a Postgraduate Diploma in Occupational Health from the University of KwaZulu-Natal. She is a certified independent medical examiner with the American Board of Independent Examiners.

Dr Murwamphida has been practicing medicine for 12 years and started her career in the mining industry at the gold mines in the Carletonville region. She currently works as an occupational medical practitioner at Life Healthcare – Life Occupational Health, and for the South32 mine, a role she has held since 2014. She is legally appointed at South32 Coal Mine to provide occupational health services. Her scope of work includes medical incapacity management, fitness for work assessments, injury on duty and occupational diseases management.

Dr Murwamphida is passionate about employee wellness and strives to live a healthy lifestyle. She participates in half-marathon (21 km) races every weekend and intends to compete in the Old Mutual Two Oceans Ultra Marathon in 2018.

We wish Dr Moyo-Mubayiwa and Dr Murwamphida a very successful and fruitful presidential year.