

## NOTICE 1334 OF 2007



## SAFETY IN MINES RESEARCH ADVISORY COMMITTEE

*Established in terms of Section 41(2) (a) of the Mine Health and Safety Act, 1996 (Act 29 of 1996)*

Thrust 9: Special Projects
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## Project title

SIM 060602: An Investigation of digital chest radiography the SOUTH AFRICAN MINING INDUSTRY
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| <ul style="list-style-type: none"> <li>• Phase 1: To test reproducibility of digital chest x-ray against analogue for detection silicosis and pulmonary TB.</li> <li>• Phase 2: To develop Standards</li> </ul> |
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## Motivation

With the increasing switch from analogue (film-screen) to digital radiography in the occupational health setting, there is a need to establish the reproducibility (reliability) of digital for film radiographs for the common occupational diseases. In the mining industry, these are pneumoconiosis and pulmonary tuberculosis.

**Statement:**

The South African mining industry has over many decades been using conventional analogue chest x-rays for medical surveillance of occupational lung disease until recently when some of the large mines moved to using digital x-rays. Digital x-rays are considered by many to improve diagnosis and improvement in efficiencies by streamlining workflow for technologists, radiologists and others. Literature review indicate that most experts and end users agree that it is only a matter of time before digital radiography imaging completely replaces films due to the former's perceived advantages of digital image processing, electronic archiving, tele-radiography and the potential for optimisation of image acquisition and display independently<sup>1</sup>. Another study concluded that Flat Panel Detector (FPD) showed image quality and agreement as that of Analogue chest Radiography (AR) with regards to small profusion categories assuring suitability in pneumoconiosis screening, but Storage Phosphor Computed Radiography (SR) had significantly less profusion than FDP or Analogue Chest Radiography and optimal imaging parameters for pneumoconioses screening needed agreement<sup>2</sup>. Franzblau et al. study (2007, unpublished final report) established the reproducibility of digital radiography in respect of pneumoconiosis. Phrased differently, the study that there were few significant differences in the reliability of image classifications across formats, and these differences were solely among classifications of image quality i.e. the consistency with which readers interpret CR is approximately the same as with which they interpret hard and soft copies. These authors also concluded in their study that Large Opacities: All image formats differed significantly with High resolution computed tomography C>Film Screen Radiology CR>Soft Copy digital films. The gap identified in these studies is that the study population does not have the high Pulmonary TB, which in itself may change these findings. The influence of varying the *numerical processing algorithm* used for digital radiography on reproducibility with respect to any of the above diseases was also not looked at.

**Primary outputs**

- PHASE 1:
  1. Estimates of the reproducibility of digital versus conventional film radiographs with respect to detection, diagnosis and description of pulmonary tuberculosis in South African miners.
  2. Estimates of the reproducibility of digital versus conventional film radiographs with respect to detection and description of silicosis in the South African miners. This would be useful because of the frequent co-occurrence of silicosis and tuberculosis in South Africa
  3. Assessment of the influence of varying the numerical processing algorithm for digital radiography on the detection of pulmonary tuberculosis and silicosis in South African miners.
  4. A set of digital and conventional radiograph pairs read by expert readers which could serve as a seed pool of standard digital radiographs for a future standardization project.

PHASE 1 WILL BE USED LATER IN SCOPING THE DEVELOPMENT OF SOUTH AFRICAN MINING INDUSTRY DIGITAL STANDARDS

**Scope**

The scope includes amongst other the design of study by epidemiologists and statisticians familiar with the occupational lung diseases, reading methodology and analytic techniques for reproducibility analysis, collection of sufficient digital-conventional film pairs from active and former gold-miners covering the required spectrum of disease for silicosis and pulmonary tuberculosis, as well as a selected range of numerical processing algorithms settings, reading by an international pool of expert readers for pneumoconiosis and tuberculosis recruited by principal investigators, statistical analysis and final write by principal investigators.

**Tender requirement:**

An organisation with proven project management and IT experience track record with teams that include for an example management and coordination of radiograph collection and quality control. Transportation of radiographs amongst readers and storage of radiographs. Putting up a team of special skills team as identified under academic setting below as well as methodology to achieve the primary outputs

**Special skills and facilities required by project team**

- Academic setting
  - i) B readers
  - ii) Physicist to amongst others, input on variables
  - iii) Epidemiologist to amongst other, provide input into study design
  - iv) Statistician (for amongst others testing reproducibility)

1. Honey, I.D et al. Investigation of optimum energies for chest imaging using film screen and computed radiography, The BJR, 78(2005), 422-427.
2. Yoshihiro, T et al. A flat panel detector digital radiography and a storage phosphor computed radiography: screening for pneumoconioses, J Occup Health 2007: 49:39-45
3. Franzblau, A et al
4. WHO/V&B/01.35: Standardisation of interpretation of chest radiographs for the diagnosis of pneumonia in children (WHO pneumonia trial investigators' group provides some reference as a departure of the methodology.