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MULTI-OBJECTIVE OPTIMIZATION MODEL FOR OCCUPATIONAL RADIATION EXPOSURE

Introduction
Continuous supervision of employee radiation dosage is crucial to sustain dosimeter standards in workplaces. In a variety of work places, radiation accidents continue to occur and eliminating them totally is still a great challenge. Employers strive to ensure compliance with radiation protection standards; where emergency plans are taken in the event of a radiation accident. However, historical review of the radiation exposure among workers indicate that dozes have decreased with time due to radiation protection practices since the discovery of x-rays. Despite the positive trend realized towards minimum radiation exposure, continual evaluation of occupational doze records is recommended due to the increasing number of medical imaging procedures that are currently being performed.
Methods
In this study, a multi-objective goal programming model is proposed and initially, the objective function is defined. The model seeks to minimize the positive deviations of the objective function; subject to the goal values of doze limits for employees at a radiation facility. The study examines four categories of exposure: whole body, lens of eye, skin and pregnant mothers. The sum of weighted deviations is minimized so that actual doses of radiation exposure do not surpass the recommended dose limits. The solution is determined using the simplex method for linear programming; whose solution is obtained by solving the standard minimization problem. A numerical example is presented for illustration; indicating the optimal dose limits for radiation exposure considering the four categories of exposure at the radiation facility.
Results
Results from the numerical example presented indicate a satisficing solution for radiation exposure among workers. However, overachievement or underachievement of the targeted radiation doses depends upon the priority levels and targets set in line with the categories of body exposure to radiation at the facility considered in this study.
Conclusion
The multi-objective goal programming model for regulating occupational radiation doses can be effective; where relevant categories of exposure can be prioritized if desired. Efficient regulation of radiation doses among workers creates a positive path towards sustainable occupational radiation protection for workplace management and dose monitoring.

Speakers email

kizito.mubiru@yahoo.com

Speakers affiliation

KYAMBOGO UNIVERSITY

Name of Member State/Organization

UGANDA

Primary authors: MUBIRU, KIZITO (Kyambogo University); Ms SEMPIJJA, MAUREEN (KYAMBOGO UNIVERSITY); Dr CHRISTOPHER, SENFUKA (Kabale University)

Presenter: MUBIRU, KIZITO (Kyambogo University)

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