

Occupational Radiation Exposure Trends

In Whole Body Dosimetry - $H_p(10)$

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INTRODUCTION

Landauer Glenwood, Illinois facility services approximately 1.2 million participants in 76 different countries. Landauer provides radiation dosimeters to monitor users of radiation in medical, academic, scientific, industrial, defense, and nuclear power fields. This repository of occupational radiation exposure information was studied to determine radiation monitoring trends for whole body doses.

The trends presented are based on the cumulative $H_p(10)$ dose per participant. $H_p(10)$ measurements were made using the Luxel+ dosimeter. The Luxel+ dosimeter is an optically stimulated luminescent (OSL) dosimeter that uses aluminum oxide ($Al_2O_3:C$) as the radiation detector. The Luxel+ dosimeter is used to monitor beta and photon radiation and with the addition of CR-39 detector, the dosimeter is able to monitor neutron radiation. When a neutron dose was present, the total $H_p(10)$ was calculated as the summation of the $H_p(10)$ photon and $H_p(10)$ neutron dose components.

The lower limit of detection (LLD) for photons is 0.01 mSv (1 mrem)



Luxel+ Dosimeter

The lower limit of detection (LLD) for neutrons is 0.2 mSv (20 mrem)

OBJECTIVES

Analyze key dose indicators and trends in $H_p(10)$ dose monitoring.

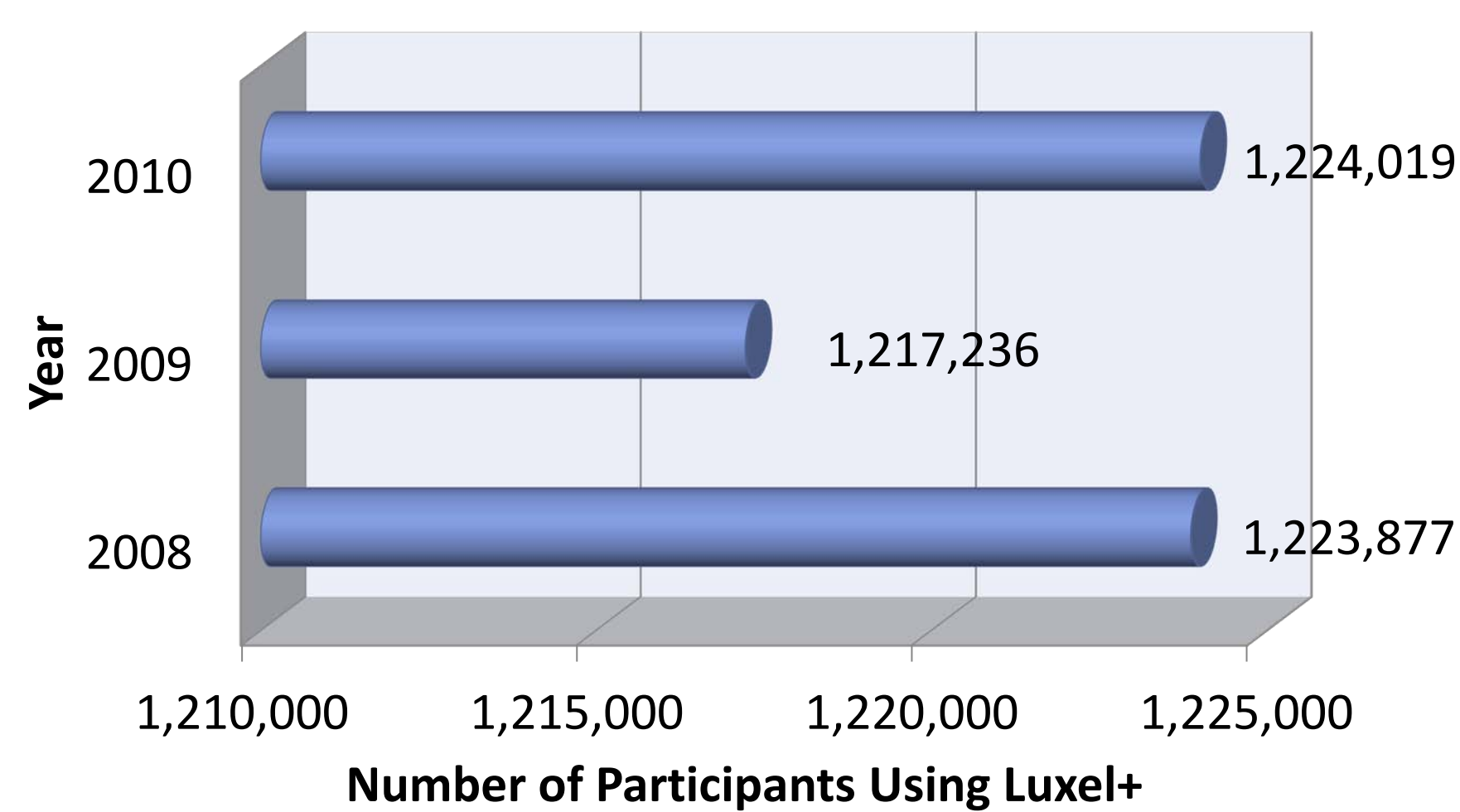
METHODS

Occupational radiation exposure information for all monitored individuals by Landauer using the Luxel+ dosimeter from calendar years 2008, 2009, and 2010 were studied. The collection of data included over 3.6 million individual records consisting of 33 million dosimeters analyzed. Doses above 50 mSv were not included in the data set. The exposure information was analyzed in terms of aggregate data. This data analysis was limited to the total $H_p(10)$. The analysis of the data included number of individuals monitored, collective dose, average dose, dose distribution, and other trends.

RESULTS

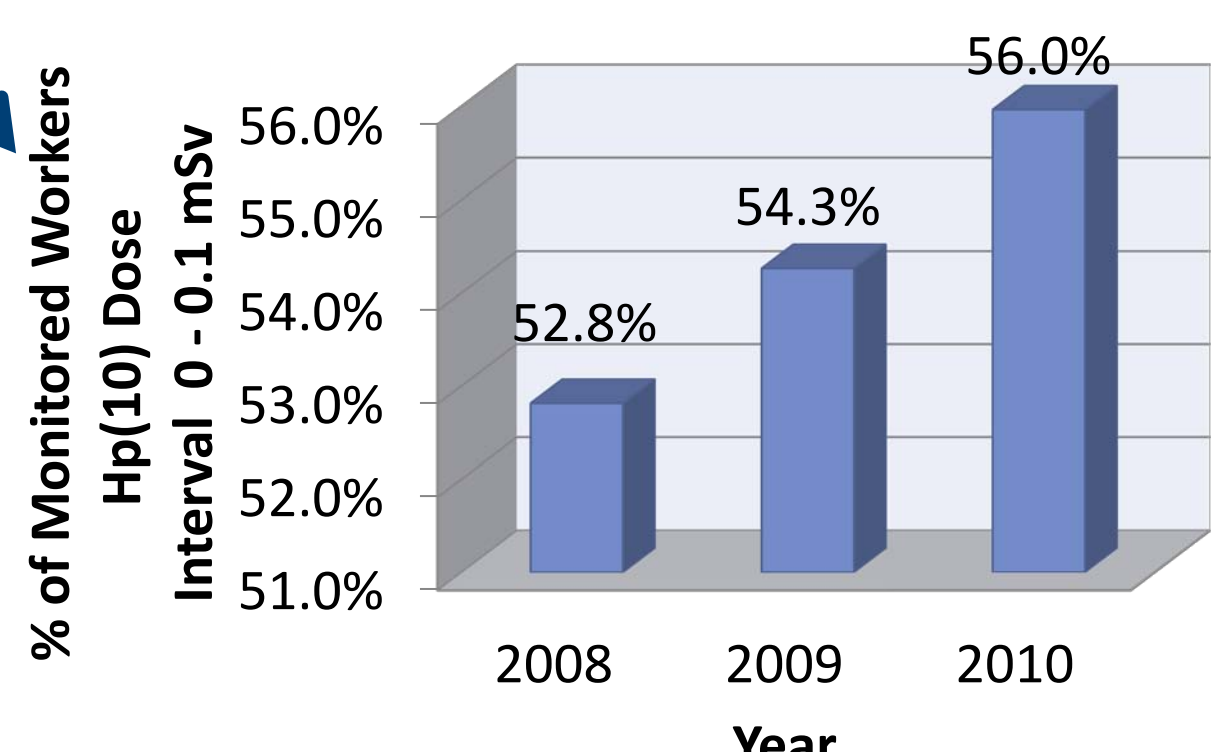
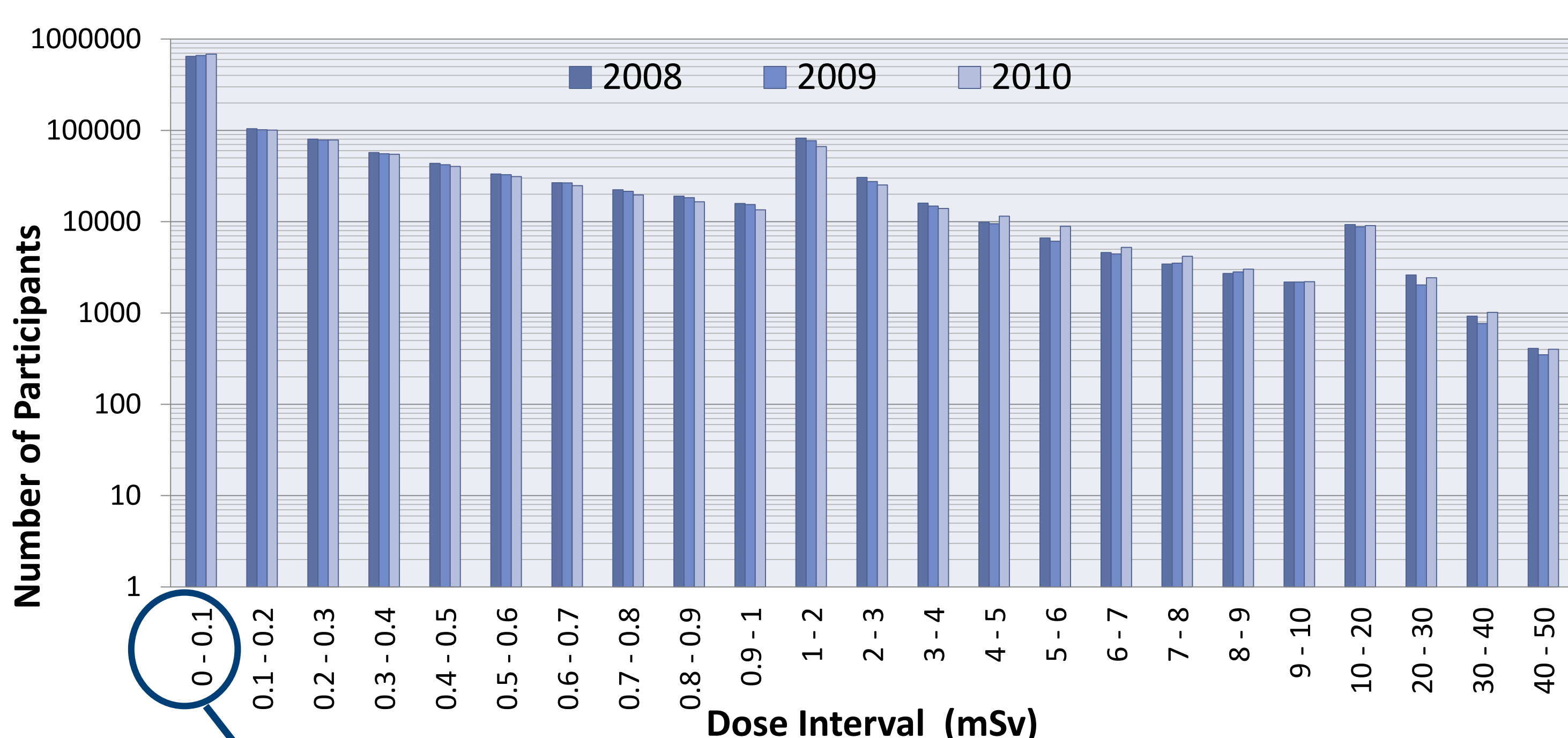
Individuals Monitored

The lowest number of monitored individuals occurred during the Global Financial Crisis when unemployment reached its peak. During this time only a 0.54% decline was observed in the number of monitored individuals.



Distribution of Doses

Number of participants in each dose interval between 0.3 to 4 mSv (30 - 400 mrem) is trending downward year over year. An increase in the number of participants was noted in the dose intervals between 4 to 50 mSv (400 to 5,000 mrem).

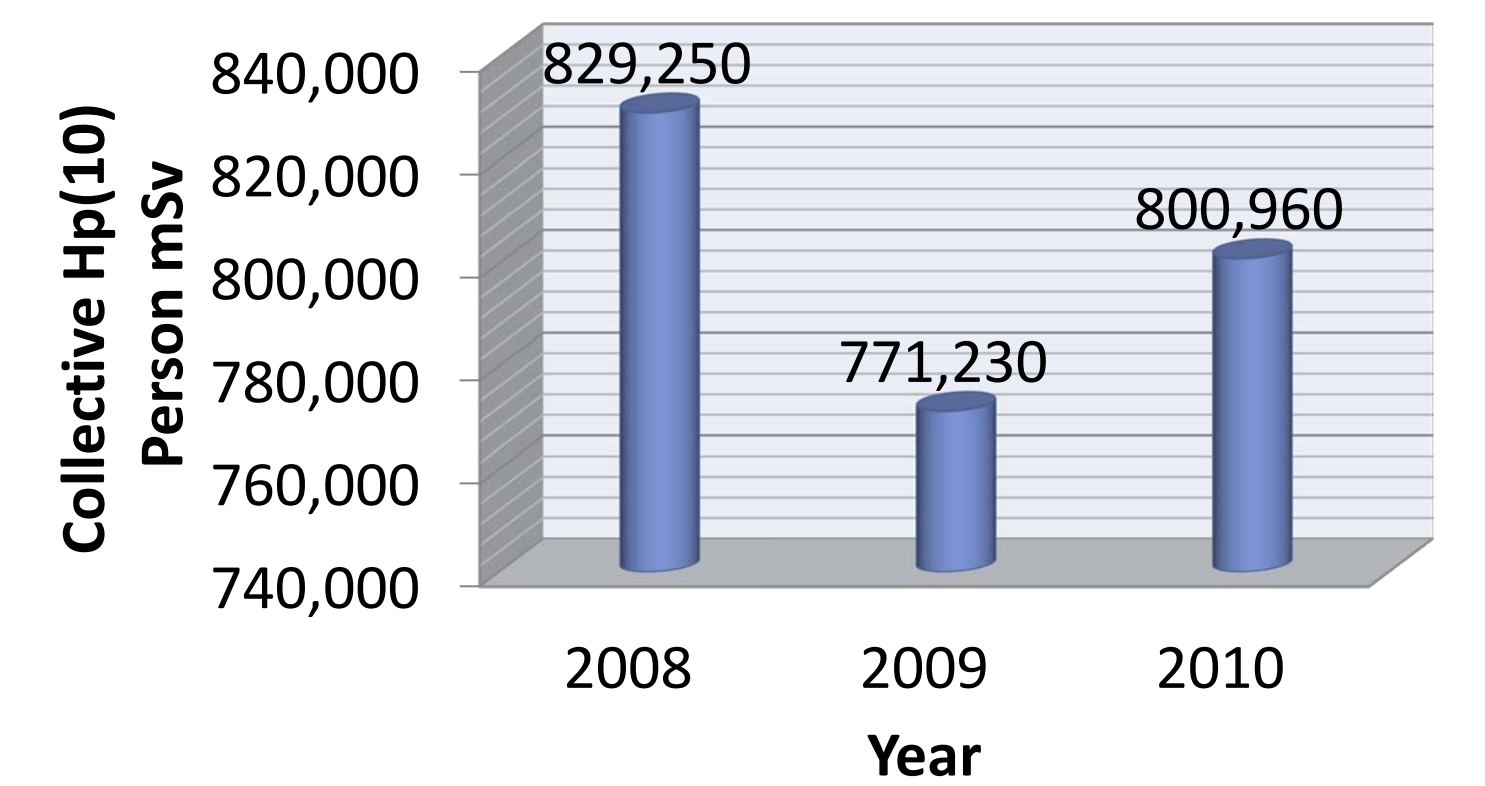


Number of monitored workers with doses between 0-0.1 mSv is increasing by approximately 2% year over year

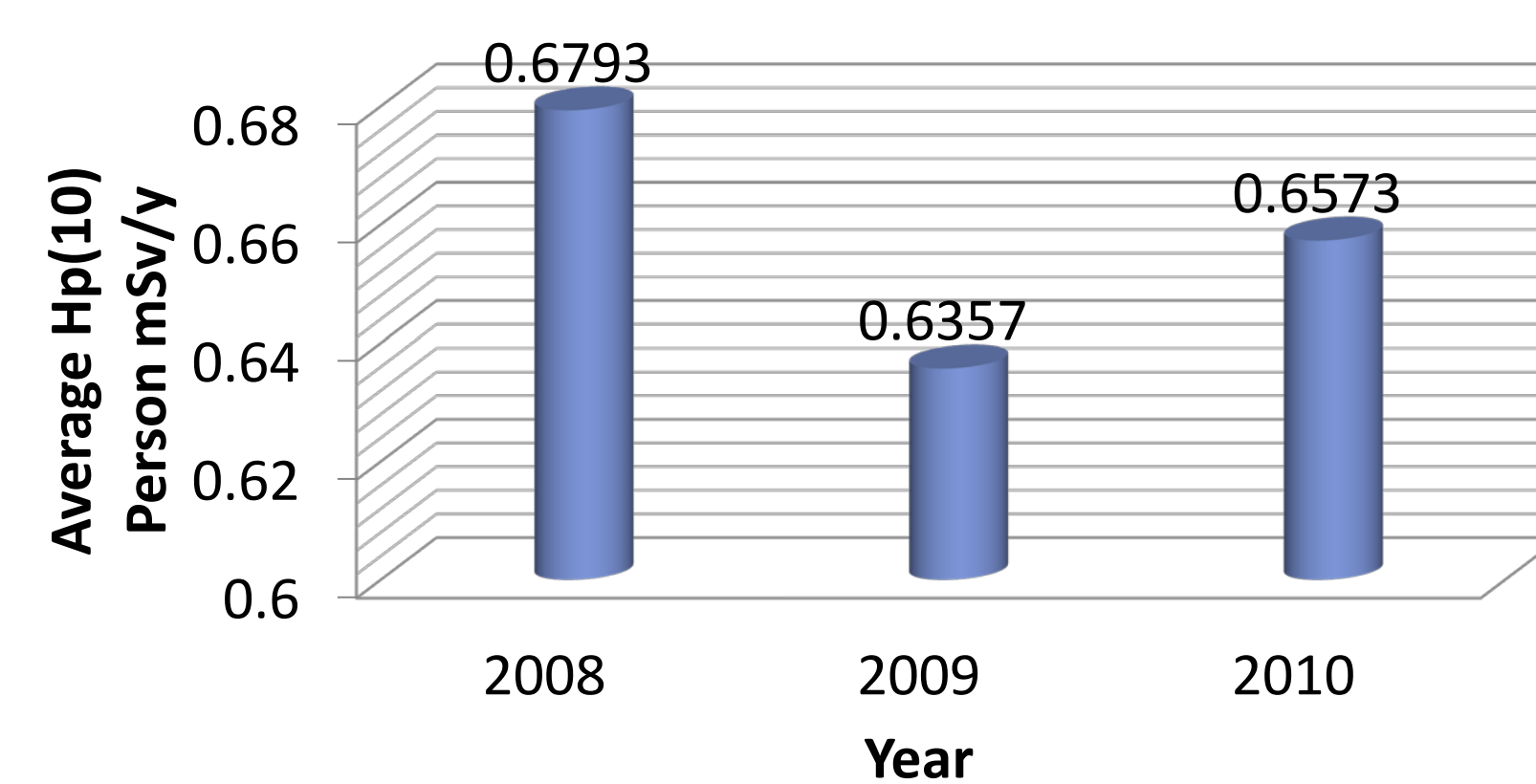
RESULTS (cont.)

Collective $H_p(10)$ Person-mSv in 0 - 50 mSv Dose Interval

The number of participants monitored has remained fairly constant between 2008 - 2010. However, a 6% decrease in Person-mSv was noted between 2008 and 2009. A 3% increase in Person-mSv was observed between 2009 and 2010.



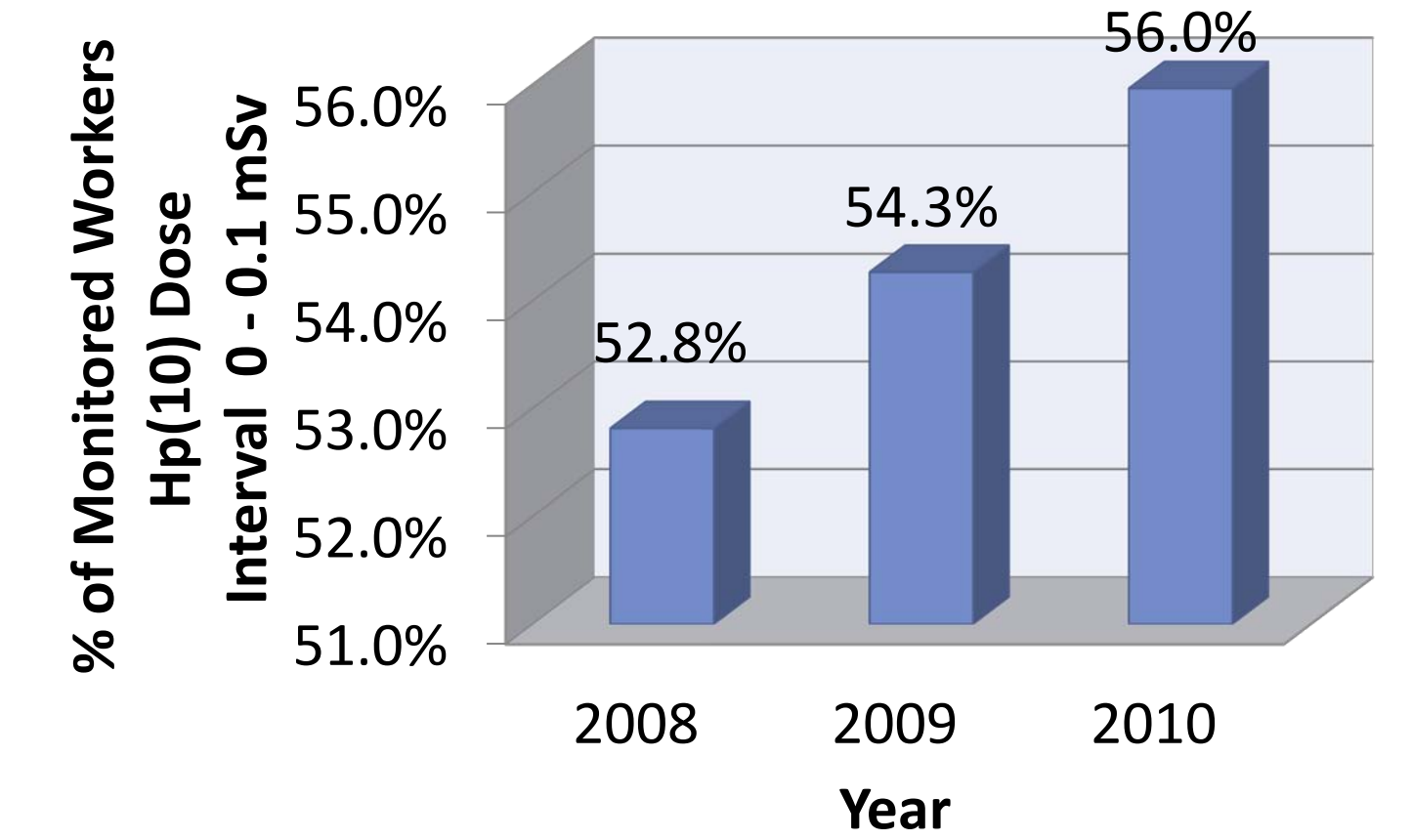
Average $H_p(10)$ Person-mSv in 0 - 50 mSv Dose Interval



Average person-mSv for 2010 was 3.4% higher than 2009 but still 3.2% lower than the average person-mSv in 2008.

Percent of Monitored Workers in 0 - 0.1 mSv $H_p(10)$ Dose Interval

Percentage of monitored workers in the lowest annual cumulative $H_p(10)$ dose interval of 0 to 0.1 mSv (10 mrem) is increasing by approximately 2% year over year

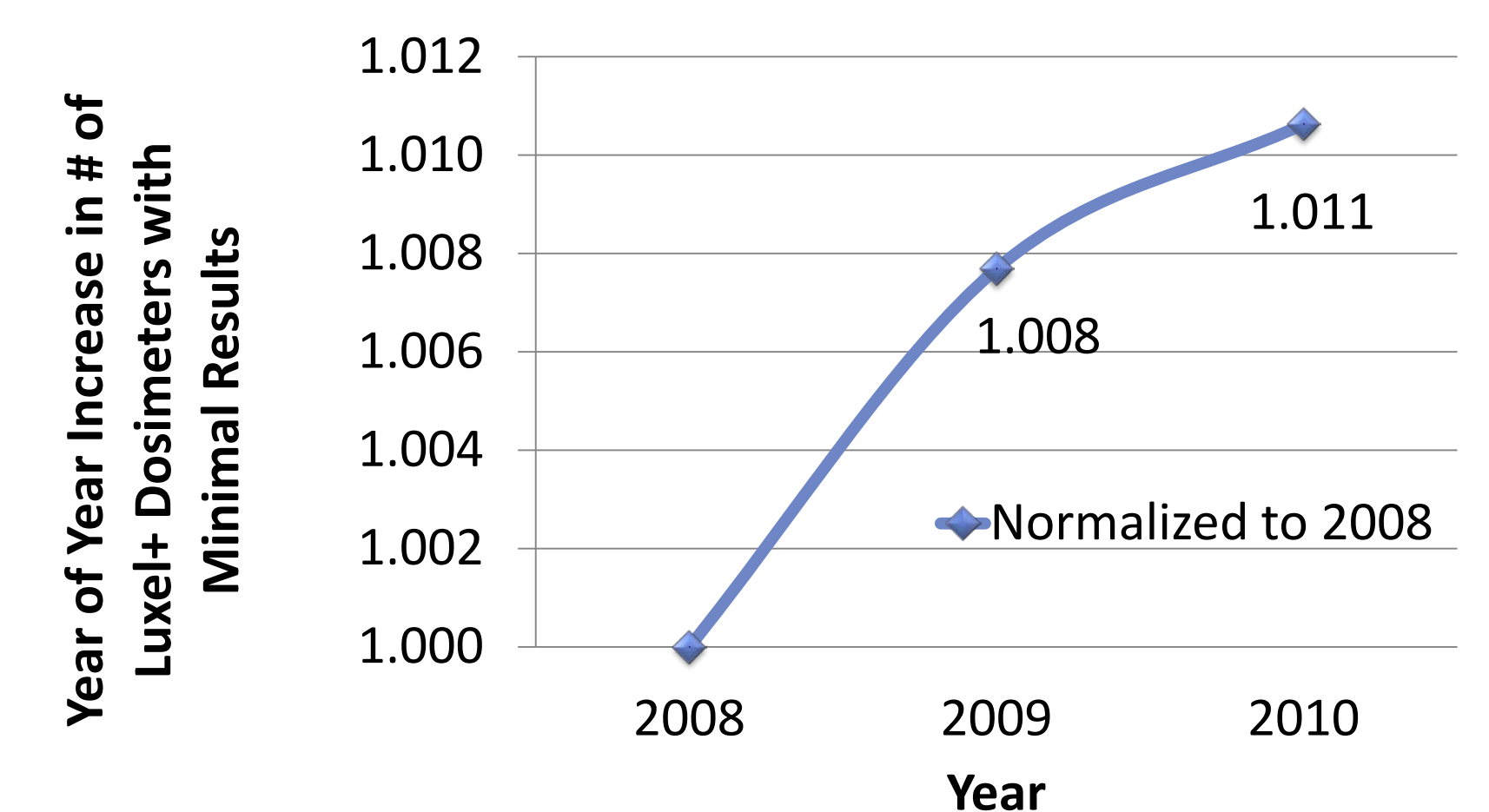


Trend may indicate renewed interest in monitoring workers with low doses.

Number of Minimal Luxel+ Dosimeters

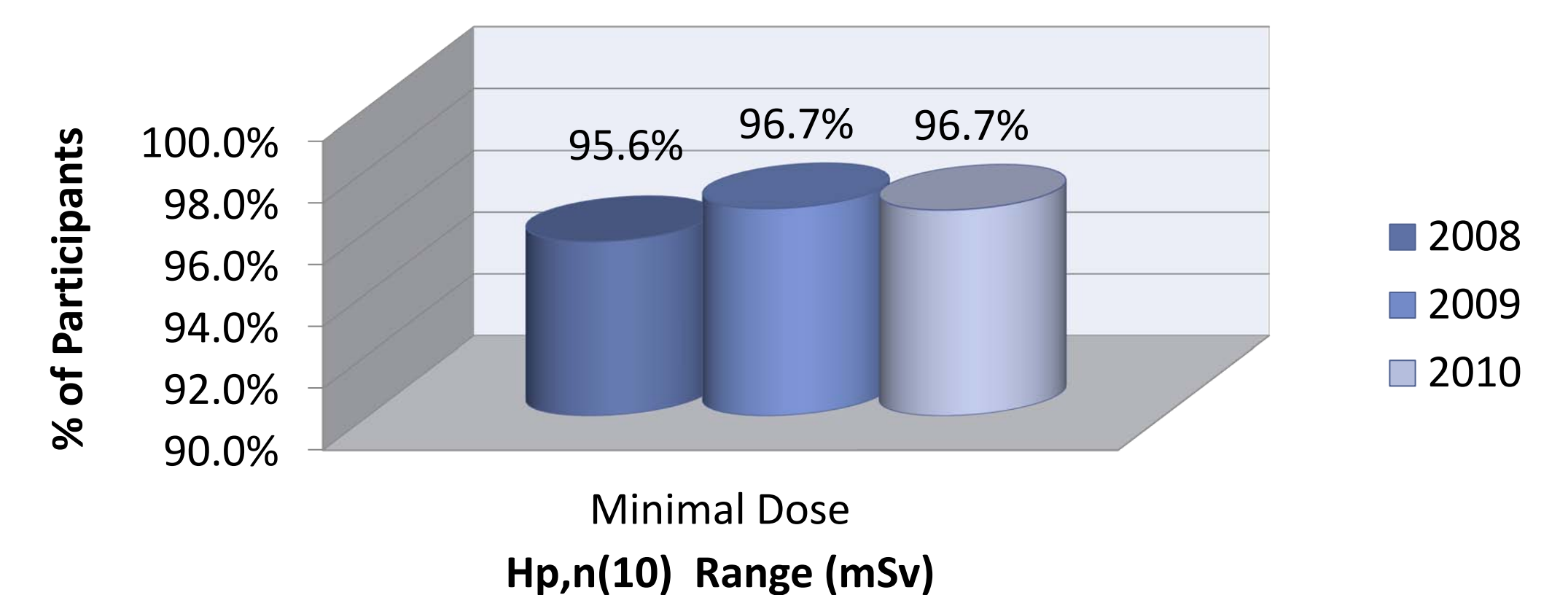
98% of all dosimeters processed are minimal (less than 0.01 mSv)

-1% increase in minimal results each year



Percentage of Monitored Workers with No Measurable Neutron Dose

-97% of participant have minimal (less than 0.2 mSv/dosimeter worn) total neutron dose



CONCLUSIONS

Trending and analysis of the occupational radiation exposure received by individuals monitored by Landauer was performed. The number of workers monitored has remained fairly consistent between 2008 through 2010 however; the collective and average person mSv has been trending downward by about 3.5%. One of the largest contributors to the decrease in dose appears to be a 1% rise in the number of minimal dosimeter results and a 3.2% increase in the number of individuals falling into the lowest dose intervals.

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