

# Assessment of Occupational Noise Exposure Among Groundskeepers in North Carolina Public Universities

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## Background

- North Carolina (NC) ranked 8<sup>th</sup> among the states with the highest employment in groundskeeping/ landscaping sector (i.e., 28,900 workers) in 2014
- Groundskeepers may have increased risk to noise-induced hearing loss (NIHL) due to the performance of noisy tasks.
- Noise exposures of groundskeepers have not been studied previously.

## Purpose of the Study

- To assess the occupational exposure of groundskeepers to noise 3 public universities in North Carolina (NC)
- To determine the association between noise exposure and certain variables (i.e., university, month, tool used)
- Goal:** To understand the risk factors influencing the noise exposures of groundskeepers to effectively develop and implement hearing conservation programs for this work group

## Methodology

- Groundskeepers were monitored for personal noise exposure during the entire work shift (8-10 hr) by wearing a noise dosimeter with 2 noise metrics (OSHA HC and NIOSH)(Fig. 1).
- Maximum sound pressure levels (SPLs) from various groundskeeping equipment were measured using a sound level meter (Fig. 2)



Figure 1. Noise dosimeter worn by a groundskeeper



Figure 2. Sound level meter

Overall mean OSHA TWA noise exposure =  $83.0 \pm 9.6$  dBA

Overall mean NIOSH TWA noise exposure =  $88.0 \pm 6.7$  dBA

Mean TWA exposure levels by university (Fig. 3) and by month when monitoring was conducted (Fig. 4) were not significantly different.

52% of the OSHA TWAs and 77% of the NIOSH TWAs exceeded 85 dBA (Table 1), at which an effective hearing conservation program is required.

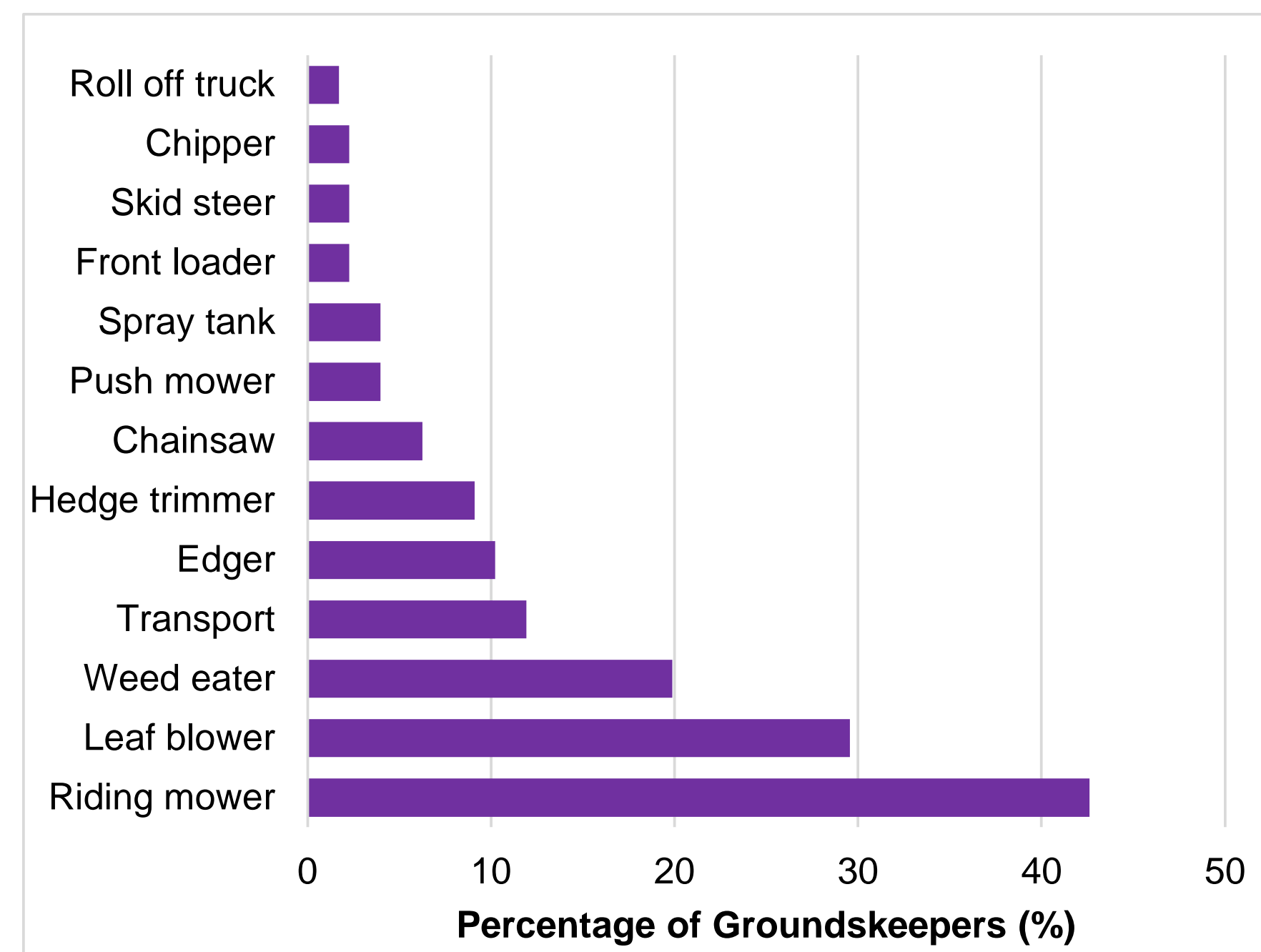


Figure 5. Percentage of Groundskeepers Using Various Equipment and Tools

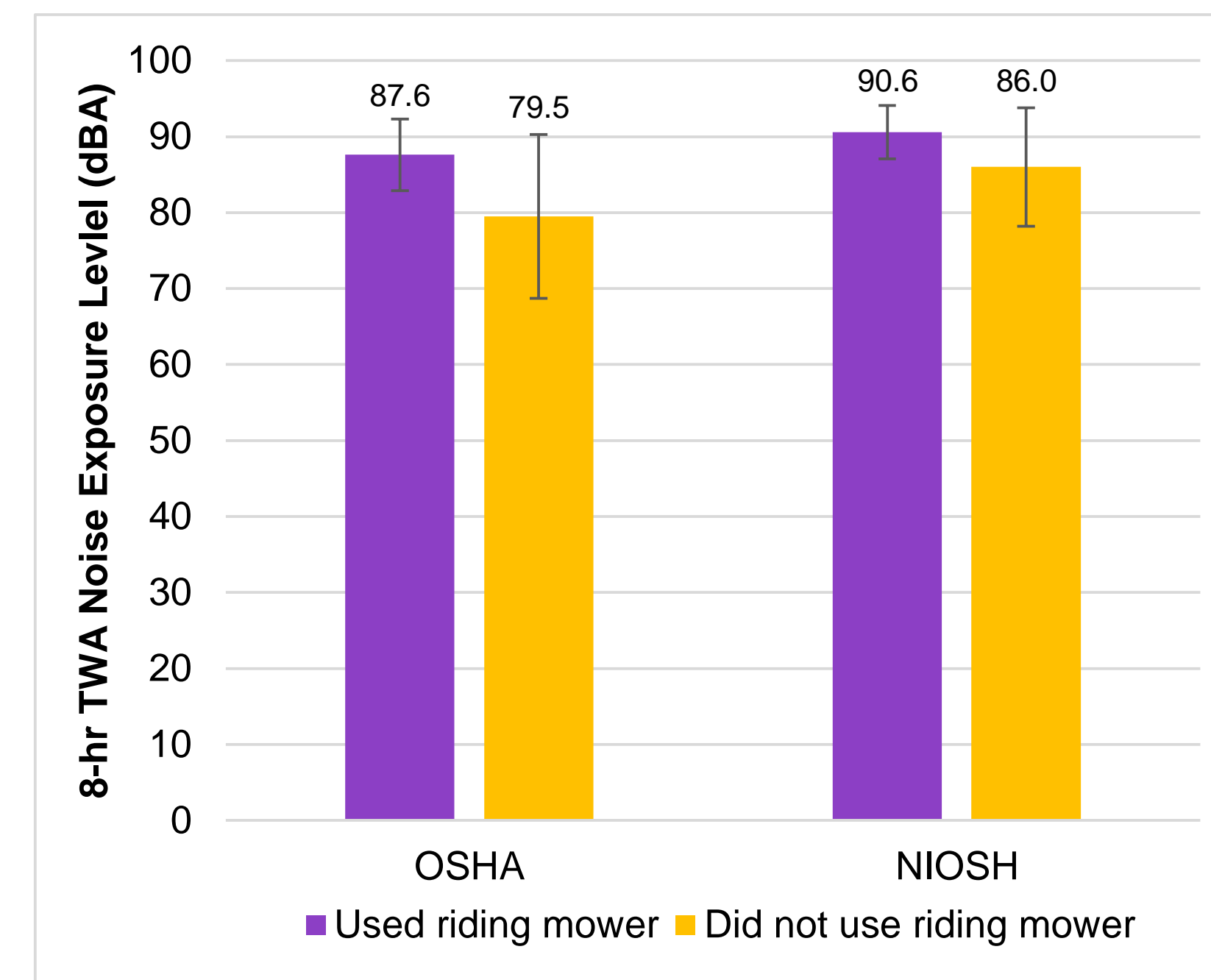


Figure 6. Mean 8-hr TWA Exposure Levels Using 2 Noise Metrics by Use of Riding Mower

Riding mower is the most reported equipment used (n=75, 42.6%) (Fig. 5).

Mean TWAs of those who used riding mowers are significantly higher ( $P<0.01$ ) than those who did not (Fig. 6).

Riding mower use was associated with having OSHA TWAs exceeding 85 and 90 dBA.



Figure 7. Noise exposure profile of a UnivB groundskeeper with 8-hr OSHA TWA = 95.5 dBA (highest TWA among riding mower users)

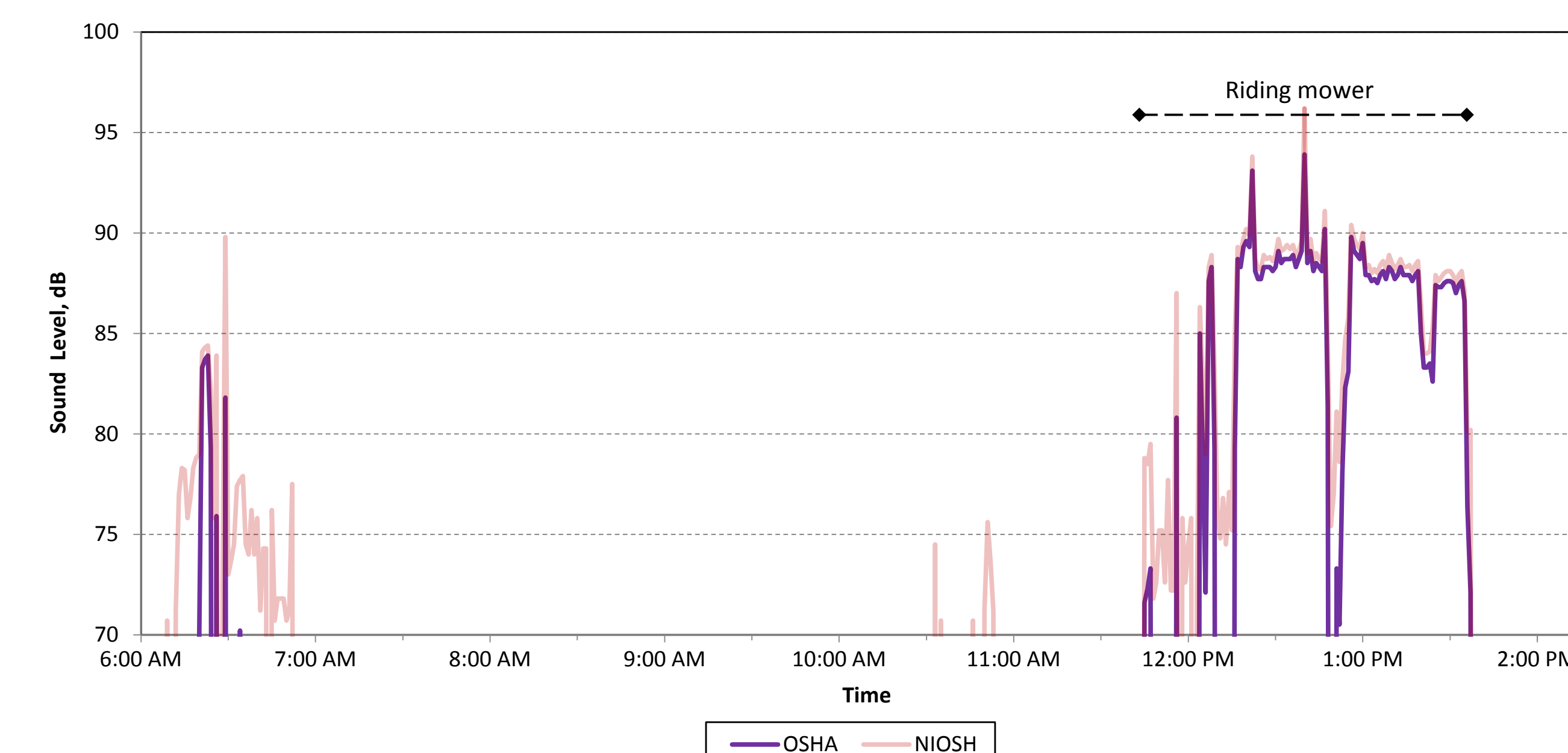


Figure 8. Noise exposure profile of a UnivB groundskeeper with 8-hr OSHA TWA = 75.5 dBA (one of lowest TWAs among riding mower users)

## Results

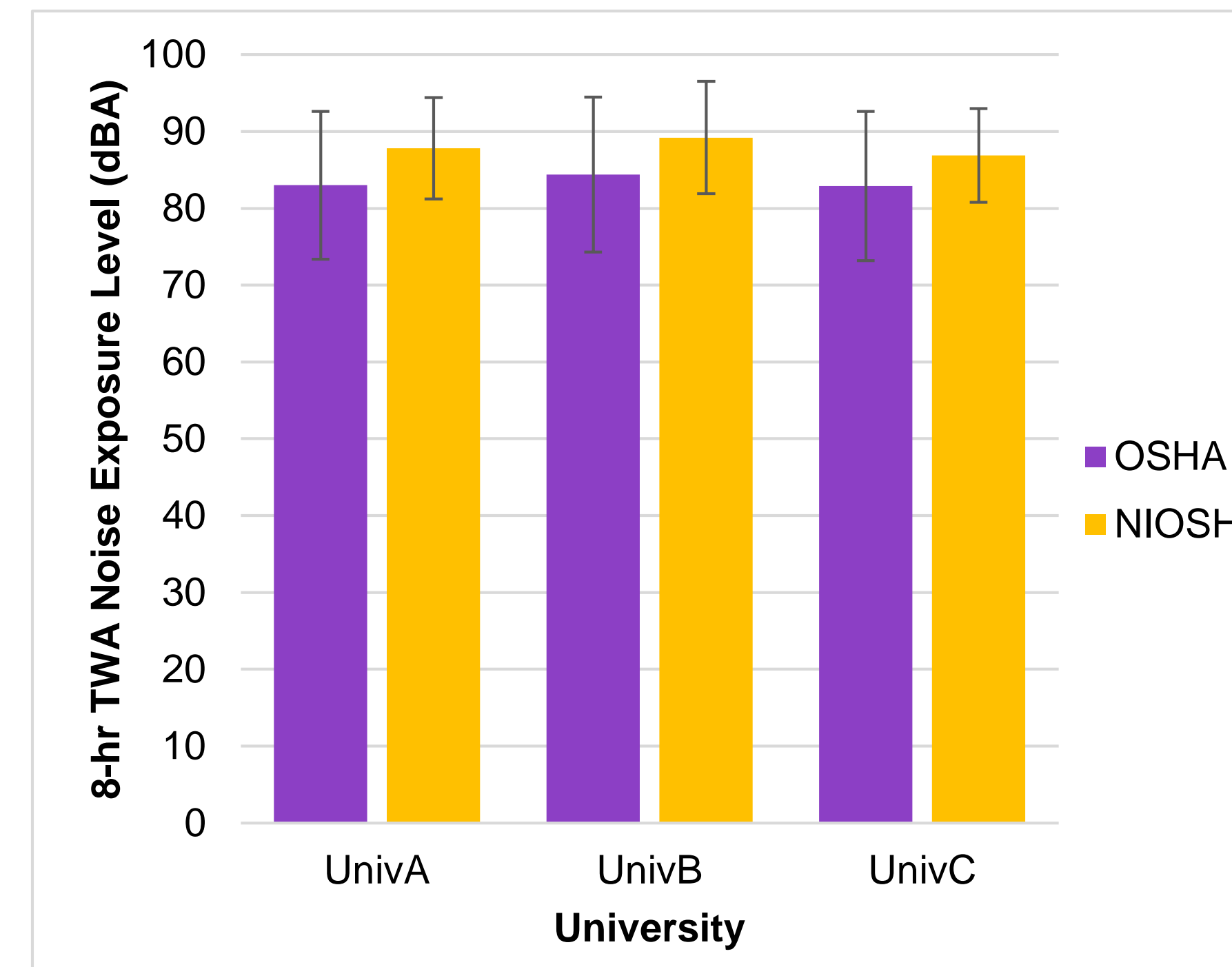


Figure 3. Mean 8-hr TWA Noise Exposure Levels Using 2 Noise Metrics by University

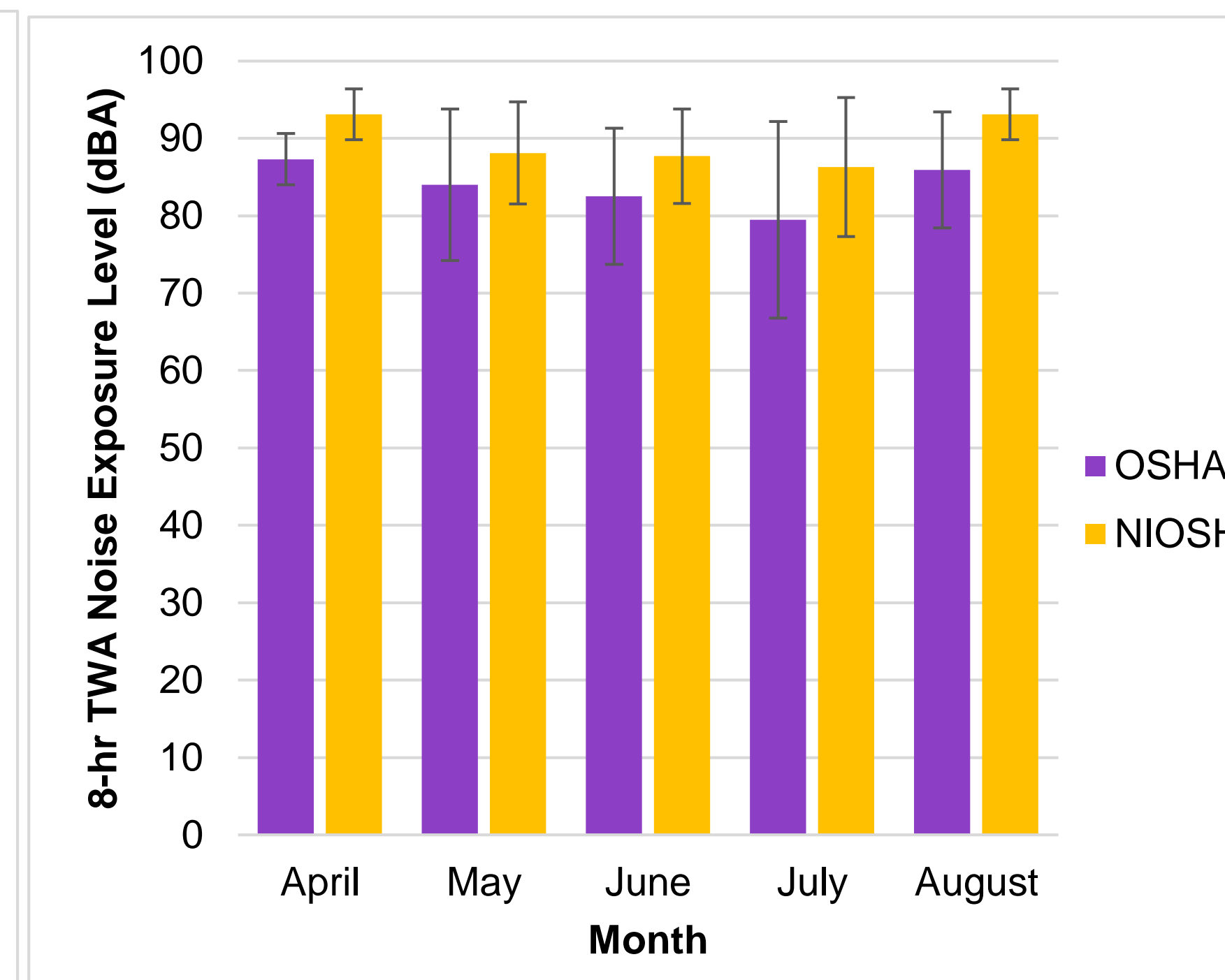


Figure 4. Mean 8-hr TWA Noise Exposure Levels Using 2 Noise Metrics by Month

Table 1. Exceedence Percentages (%) Using 2 Noise Metrics by University

University	n	OSHA		NIOSH	
		>85 dBA	>90 dBA	>85 dBA	>90 dBA
All	176	52.3	20.5	76.7	47.2
UnivA	81	45.7	13.6	76.5	42.0
UnivB	50	66.0	28.0	82.0	62.0
UnivC	45	48.9	24.4	71.1	40.0

Table 2. Maximum SPLs of Selected Equipment/ Tools

Equipment/ Tool Used <sup>a</sup>	Brand/ Model	SPL (dBA)
Hand-held Tool		
Edger	Stihl (unknown)	105.5
Leaf blower	Stihl BR 600	105.9
	Stihl BR 380	102.5
Weed eater	Stihl FS 110	101.5
Chainsaw	Stihl MS 261	108.6
Hedge trimmer	Echo SHC-240	98.3
Walk-behind mower	Exmark Turf Tracer HP	97.0
Ride-on Equipment		
Riding mower	Groundsmaster 4700-D	95.9
Multipurpose tractor	Ventrac 4200	100.8
Reel mower	John Deere 7700	91.0
Stationary Equipment		
Wood chipper	Vermeer BC1000 XL	105.7

<sup>a</sup> Operated at full throttle

## Conclusions

- Groundskeepers working in university settings had noise exposures exceeding the OSHA action level and NIOSH REL of 85 dBA.
- The use of certain equipment (i.e. riding mower) was shown to be associated with high noise exposure levels.

University facilities supervisors have a very important role in reducing noise exposure of groundskeepers through effective hearing conservation programs.

## Recommendations

- Participation of universities in the NIOSH Buy Quiet Program when purchasing/upgrading equipment
- Careful scheduling of the use of noisy equipment to limit exposure time and
- Consulting employees on the selection of acceptable hearing protection devices (HPDs)
- Posting noise levels of equipment around the workplace as reminder to employees about hazardous noise exposures
- Keeping distance (at least 50 feet) between workers when weed eating simultaneously

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## Publication Source

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