



# The market value of sleep: Using economic input-output analysis to shift society's views on sleep loss

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## Introduction

Modern society is driven by economic profit and output. Sleep loss is considered to impact profit and output via fatigue related accidents. However, the consequences of sleep loss are not limited to these short term performance decrements.

Sleep loss also impacts physical and mental health, contributing to the prevalence of many diseases and social issues. These burden society with increased medical and social welfare costs. Fatigue Risk Management Systems and prescriptive legislation do not directly address these consequences.

To initiate wide reaching change to society's relationship with sleep what may be needed is a complete shift to how society values sleep. Thus, as a call to arms to other sleep scientists to creatively consider ways of shifting society's views on sleep, we posed a series novel questions.

Given that modern society is driven by economic profit and output we asked:

- *Could sleep loss be factored into the economy, could we assign a monetary value to sleep loss, and could sleep loss be linked to industry output?*
- *Furthermore, if we could do this, how would it look, what would the market value of a minute of sleep be, and how would this price differ between industries?*

## Materials and methods

Data collected in the Australian Bureau of Statistics' 2011-12 Australian Health Survey was used for analysis.

Economic Input-Output (IO) analysis calculated a cost 'footprint' of production within 19 industry sectors of the Australian economy.

Sleep loss was considered a 'resource' of an industry's production which allowed for the calculation of the value of a minute of sleep, and the amount of sleep lost per dollar spent on products in each industry.

## Results

Calculating the dollar amount associated with sleep duration allowed for comparisons of the price that each sector would pay for sleep at the current market value. The industry sector that valued the sleep of its employees the highest were Real Estate (\$465 dollars earned per minute slept) and Manufacturing (\$285), with the lowest being Health (\$6 worth of output for a minute of sleep input).

The amount of sleep lost per dollar spent within each Australian industry was also calculated. The largest sleep loss impacts were found in the Transport industry sector, where every thousand dollars spent resulted in 86 minutes of lost sleep.

In total, Australian household consumption is responsible for 267 million hours of sleep lost per year, with the Manufacturing sector contributing the largest amount: 51 million hours (19%) of lost sleep.

## Conclusions

These metrics identify industries that have moderate sleep loss in their workforce, as well as others industries that have a well slept workforce but have prevalent sleep loss in their supply chain.

The findings can be used to encourage consumers and businesses to reevaluate sleep, and work towards a well-rested, healthy, and safe society.

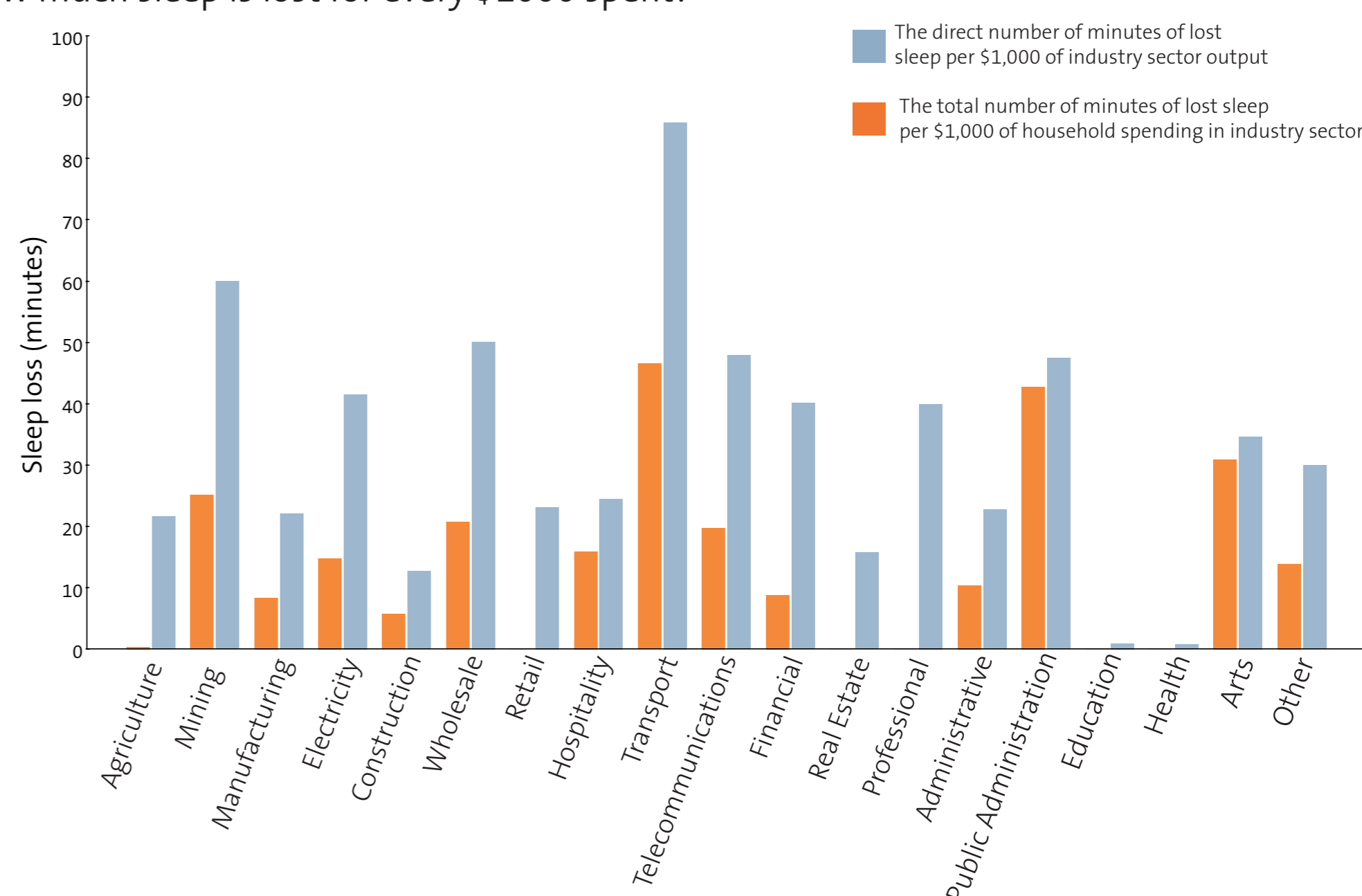
While we are not advocating for a 'sleep tax' to be imposed on industries, we are advocating for creative ways to challenge society's largely poor relationship with sleep.

Table 1: Industry sector key

Graph labels	ANZSIC sector
Agriculture:	Agriculture, Forestry and Fishing
Mining:	Mining
Manufacturing:	Manufacturing
Electricity:	Electricity, Gas, Water and Waste Services
Construction:	Construction
Wholesale:	Wholesale Trade
Retail:	Retail Trade
Hospitality:	Accommodation and Food Services
Transport:	Transport, Postal and Warehousing
Telecommunications:	Information Media and Telecommunications
Financial:	Financial and Insurance Services
Real Estate:	Rental, Hiring and Real Estate Services
Professional:	Professional, Scientific and Technical Services
Administrative:	Administrative and Support Services
Public Administration:	Public Administration and Safety
Education:	Education and Training
Health:	Health Care and Social Assistance
Arts:	Arts and Recreation Services
Other:	Other Services

Figure 1: Sleep loss coefficient

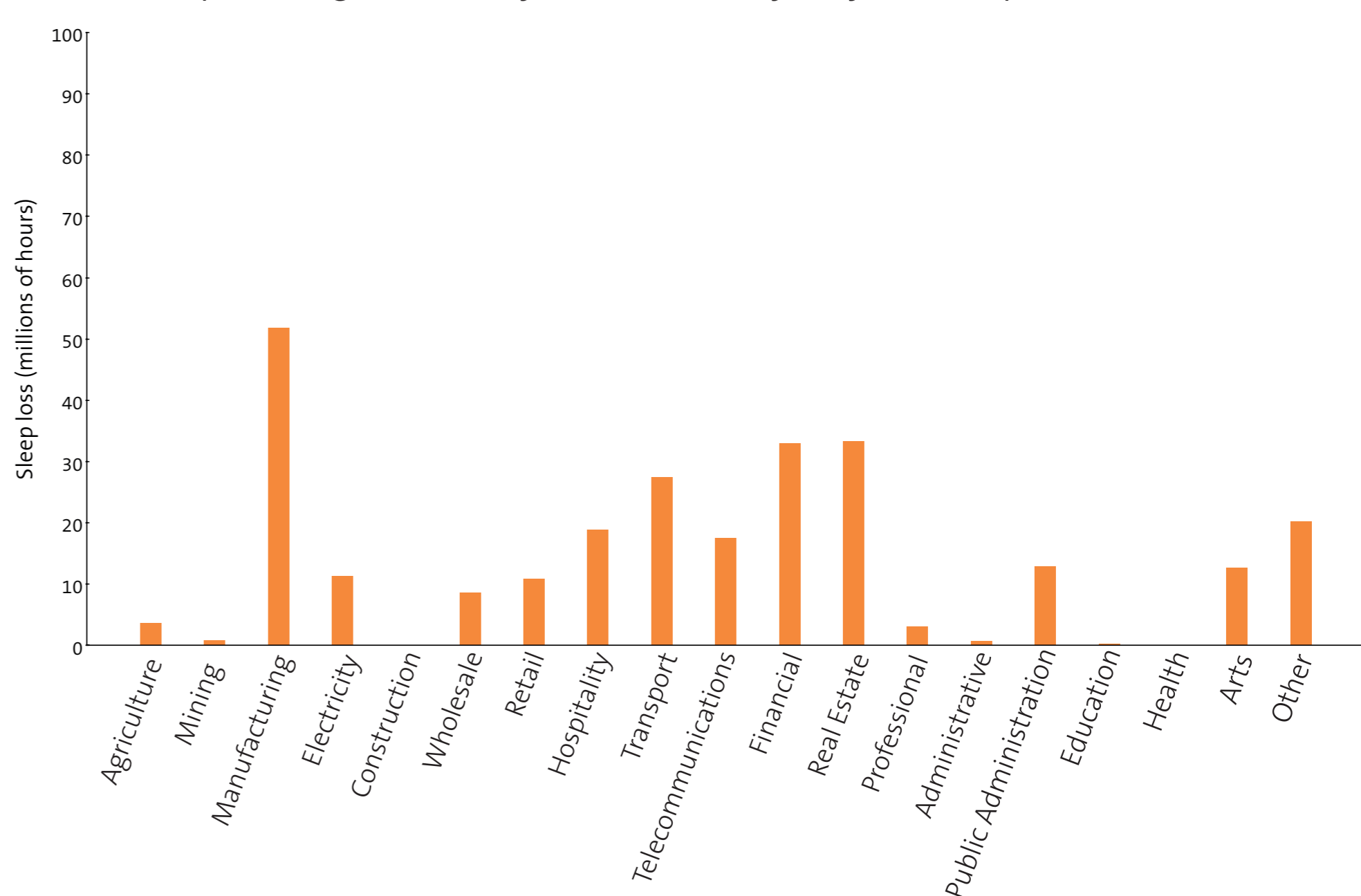
How much sleep is lost for every \$1000 spent?



The direct and total number of minutes of lost sleep per \$1,000 dollars of household spending in industry. This provides the amount of sleep lost per \$1,000 dollars spent by a consumer in that sector.

Figure 2: Consuming sleep

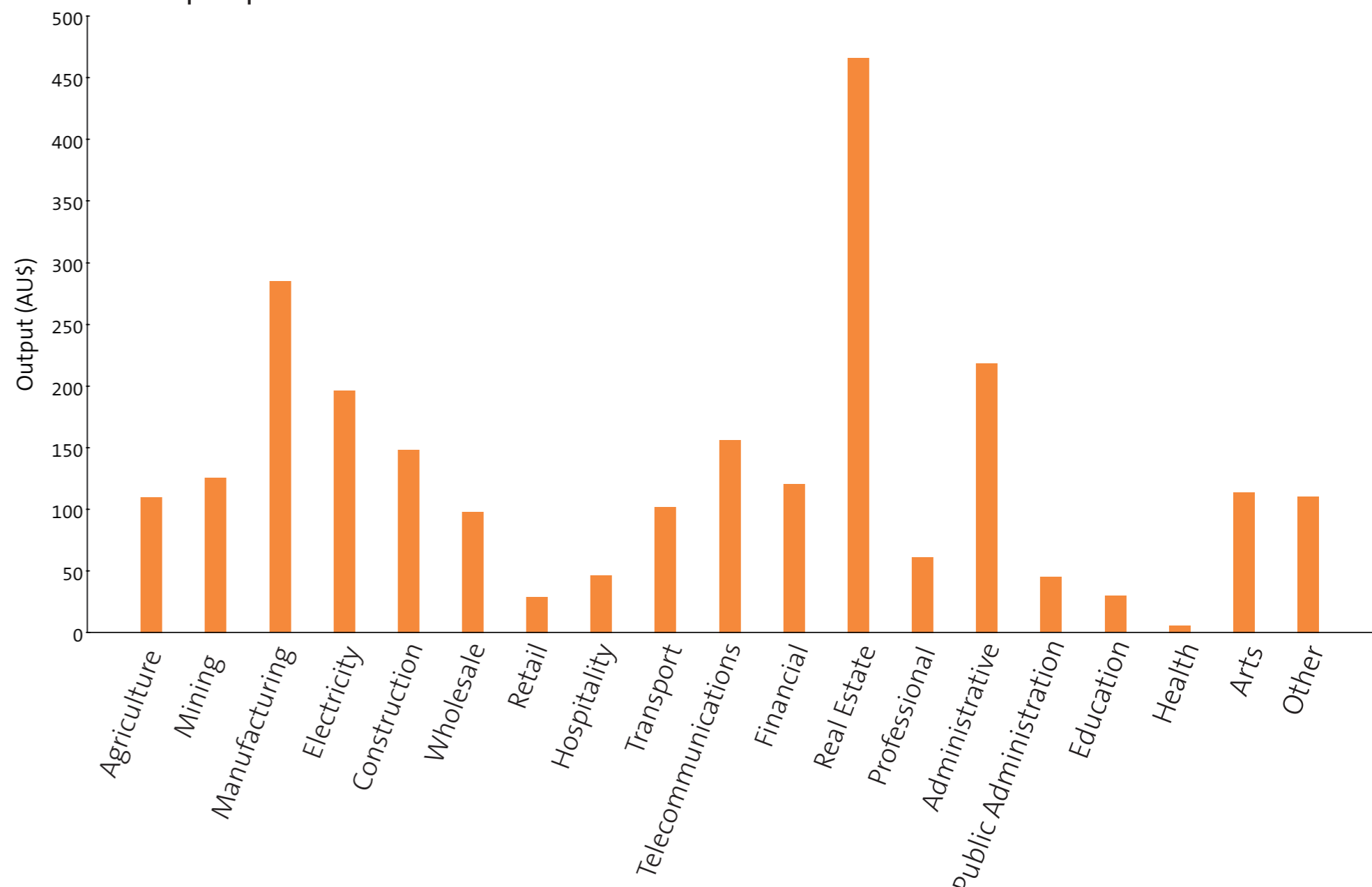
How much sleep loss is generated by a household's yearly consumption?



The total number of hours of lost sleep that can be attributed to Australian household consumption activities. Axis in millions of hours.

Figure 3: The market value of sleep - dollars earned per sleep spent

If sleep was a resource necessary to produce a product, what is the gross dollar output per minute of sleep input?



The total industry dollar output divided by the total amount of sleep. This provides an indication of dollar earnings (or value) that could be attributed to one minute of sleep.

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