

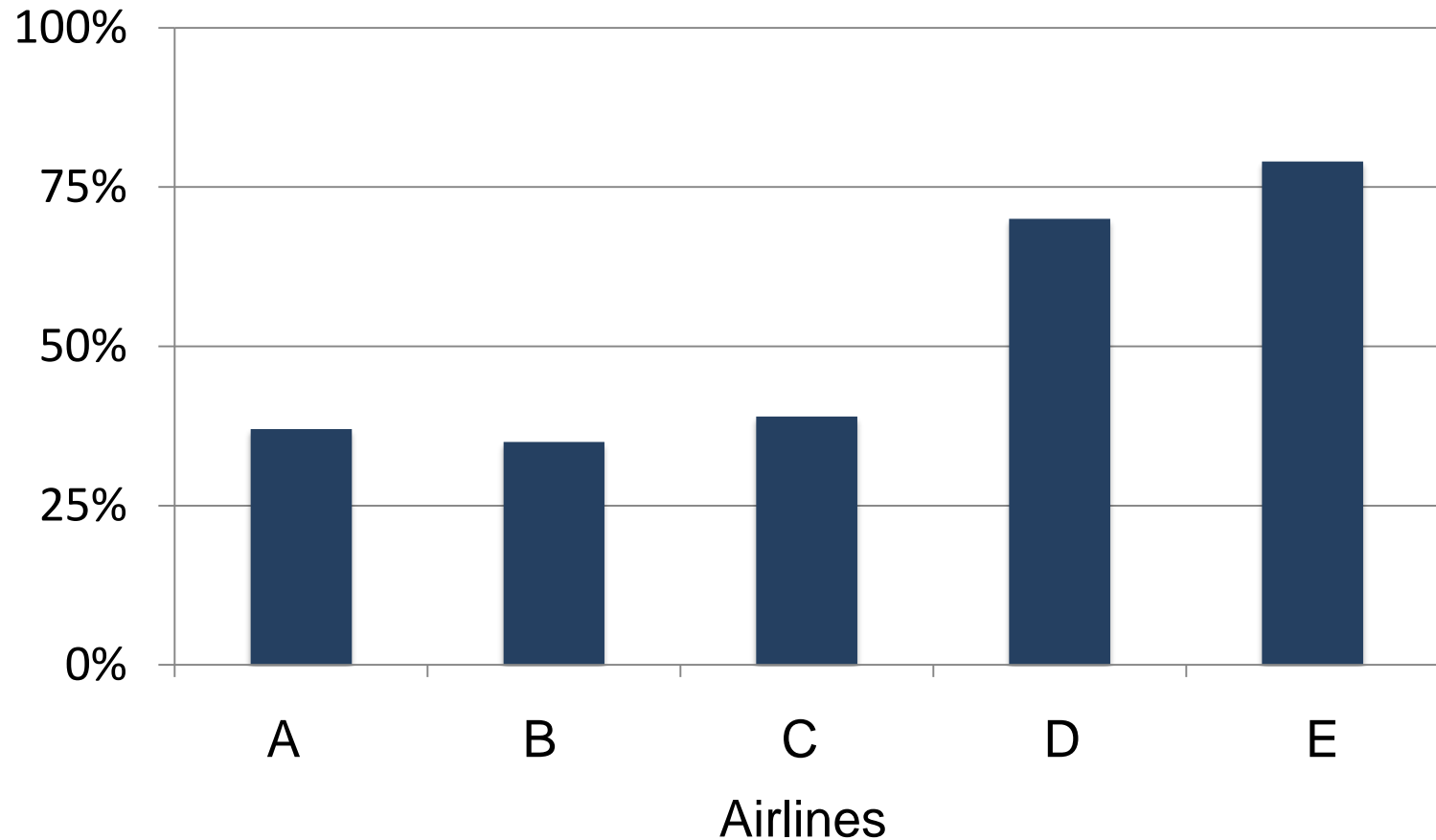
# The Economic Costs of Insufficient Sleep (RAND 2017)

Economic modelling found, for 5 OECD countries, lack of sleep contributes to losses of up to 3% GDP

When workers sleep <6h, they lose 6 working days due to absence / presentism

“An increase in sleep could add billions of dollars to a country's economy

# % of short-haul crew who say they always or often obtain less than 6 hours sleep prior to a duty



# Fatigue-related accidents

An iceberg floating in the ocean under a blue sky. The tip of the iceberg is above the water, while the much larger base is submerged. Various text labels are placed around the iceberg to represent different factors related to fatigue.

Short-term absence

Reduced crew  
performance and  
ability to cope with  
complexity

Attrition

Recruitment

Reputation

Extra Training

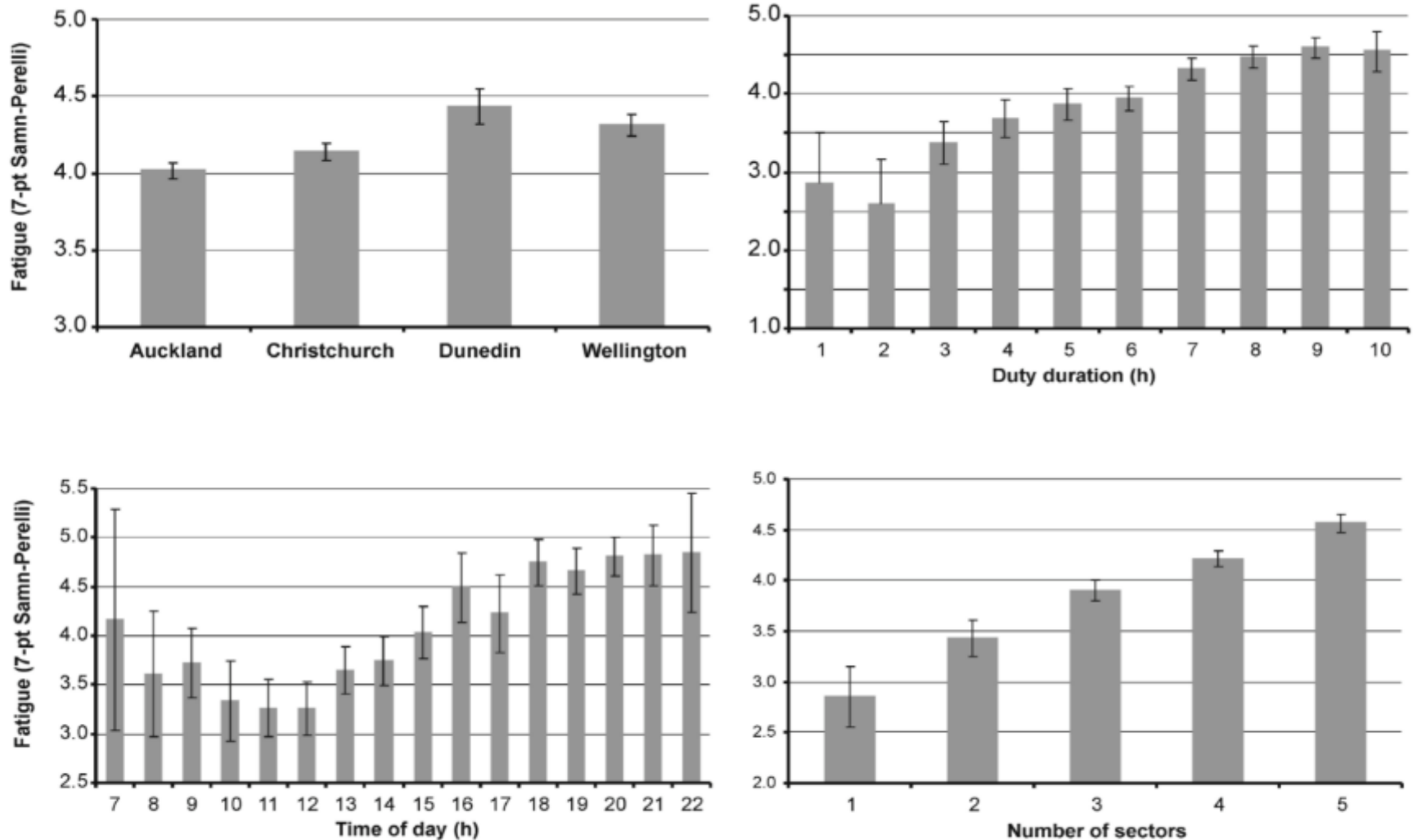
Intentional  
non-compliance

Incidents

# How do we balance productivity and safety?

- In safety critical, cognitively demanding settings, fatigue is expensive. Therefore, fatigue management is not the enemy of productivity, rather it ensures sustainable production
- Improve fatigue measurement
- Enabling risk management and a tailored FTL scheme – including both derogations and tighter controls

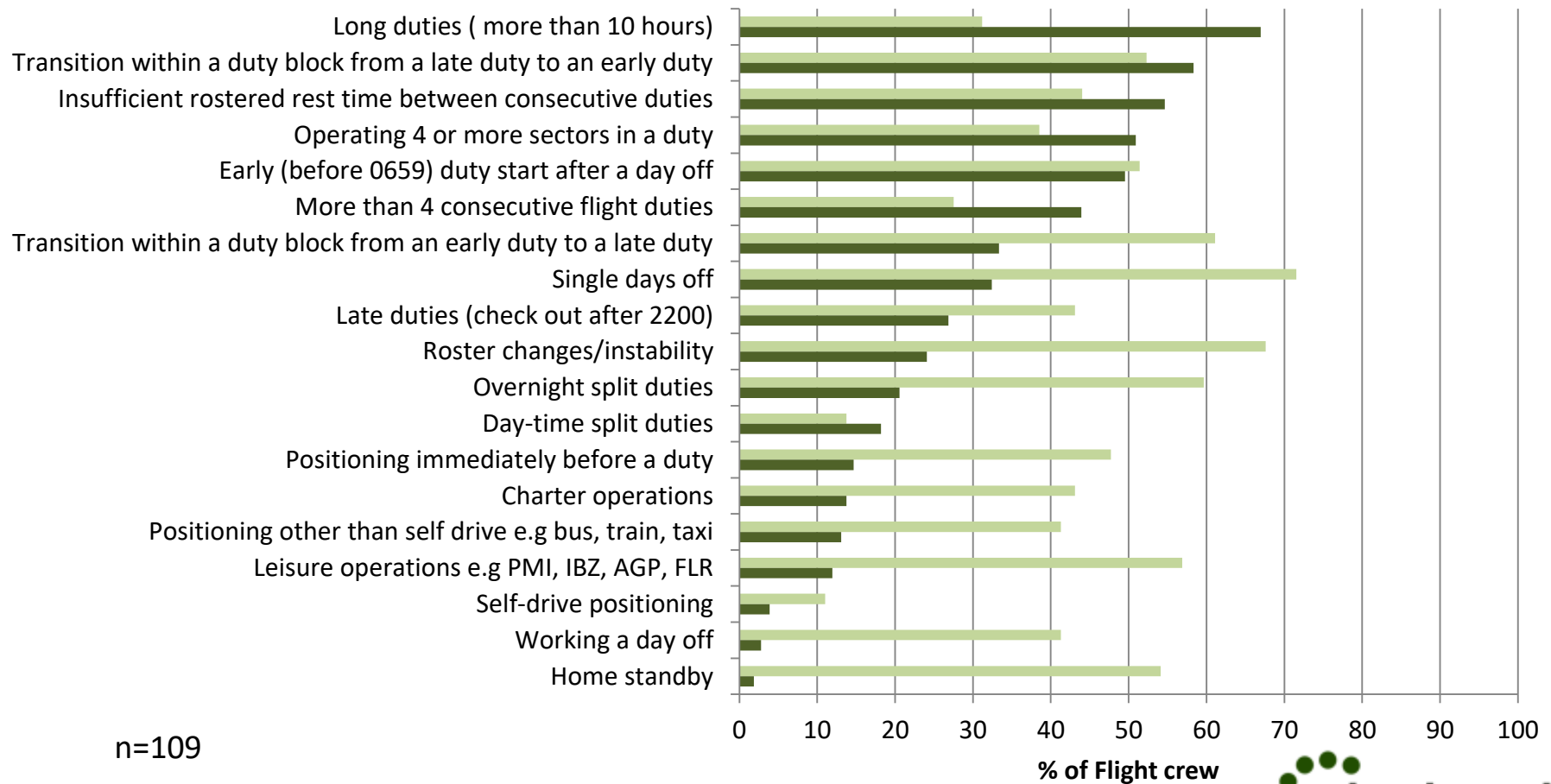
# TOD survey: Samn-Perelli fatigue scores



**Fig. 2.** The main effect of four factors that have a significant effect on levels of fatigue at the top of descent: the departure airport (top left), the length of duty (top right), the time of day (bottom left), and the number of sectors (bottom right). Error bars correspond to  $\pm 1$  SEM.

## % crew who indicated that a factor:

- caused high fatigue is shown in dark green (severity)
- was encountered weekly/ fortnightly is shown in light green (frequency)



# FRM POLICY

## EFFECTIVE REPORTING SYSTEM

### Fatigue Risk Management (FRM) Processes

Data Collection and  
Hazard Identification

Risk Assessment

Risk Management

### FRM Safety Assurance Processes

Performance Monitoring

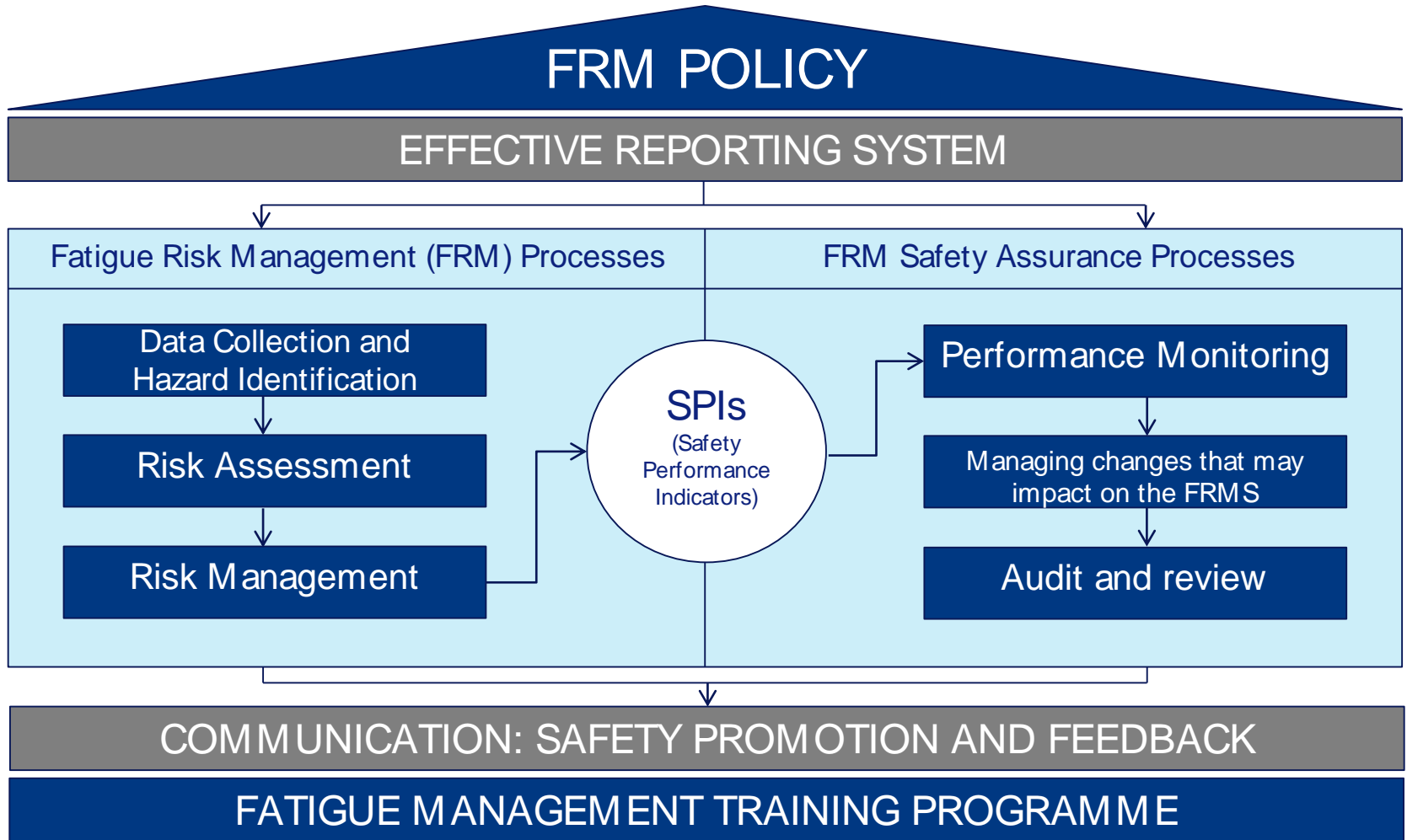
Managing changes that may  
impact on the FRMS

Audit and review

**SPIs**  
(Safety  
Performance  
Indicators)

COMMUNICATION: SAFETY PROMOTION AND FEEDBACK

FATIGUE MANAGEMENT TRAINING PROGRAMME



# ORO.FTL. 110 Operator Responsibilities (b)

Ensure that flight duty periods are planned in a way that enables crew members to remain sufficiently free from fatigue so that they can operate to a satisfactory level of safety under all circumstances;