Hospital performance in New Zealand

Variations in productivity and efficiency

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Productivity and efficiency of hospitals in NZ

- Conceptually
- Measurement(ally)
- Realistically

Productivity - Conceptually

- Technically
  - Ratio of outputs to inputs
    - Multiple outputs, multiple inputs
    - So Output Index/Input Index
- Plain language
  - Amount of hospital services (output) produced with one unit of inputs
- Measurement
  - Combining multiple outputs & multiple inputs into single indices (for ratio)

Efficiency - Conceptually

- Technically
  - Technical efficiency – best combination of resources (inputs) to produce each output
  - Allocative efficiency – lowest cost combination of resources (inputs) to produce given outputs (in NZ context)
- Plain language
  - How efficiently are resources used to produce hospital services
- Measurement
  - Data envelopment analysis, Malmquist indices, stochastic frontier analysis

Measurement - Productivity

- Productivity index Pi_{it}
  - Productivity $Index_{it}$ = Output $Index_{it}$ / Input $Index_{it}$
    - i = hospital (or DHB), t = time period (month, quarter, year)

- Output $Index_{it} = {}_j\sum q_{ijt}\ w_j$
  - j = treatment types
  - q_{ijt} treatments of type j provided by hospital i at time t
  - w_j (constant) weight for treatment type j (DRG)

- Input Index = ${}_k\sum x_{ikt}\ w_{kt}$
  - xikt resource k used in hospital i at time t
  - w_{kt} weight (price) of resource k at time t

Measurement – Outputs & Inputs

- Outputs - follow the flow
  - Day patient discharges
  - Length of stay
  - Inpatient discharges
    - Stats NZ & MoH weights
      - IP – casemix adj. 85.5%; ALOS (7.5%); DP (7%)
- Inputs
  - Labor – FTE by type
  - Capital - ??
  - Consumables (intermediate consumption)

Productivity - Realistically

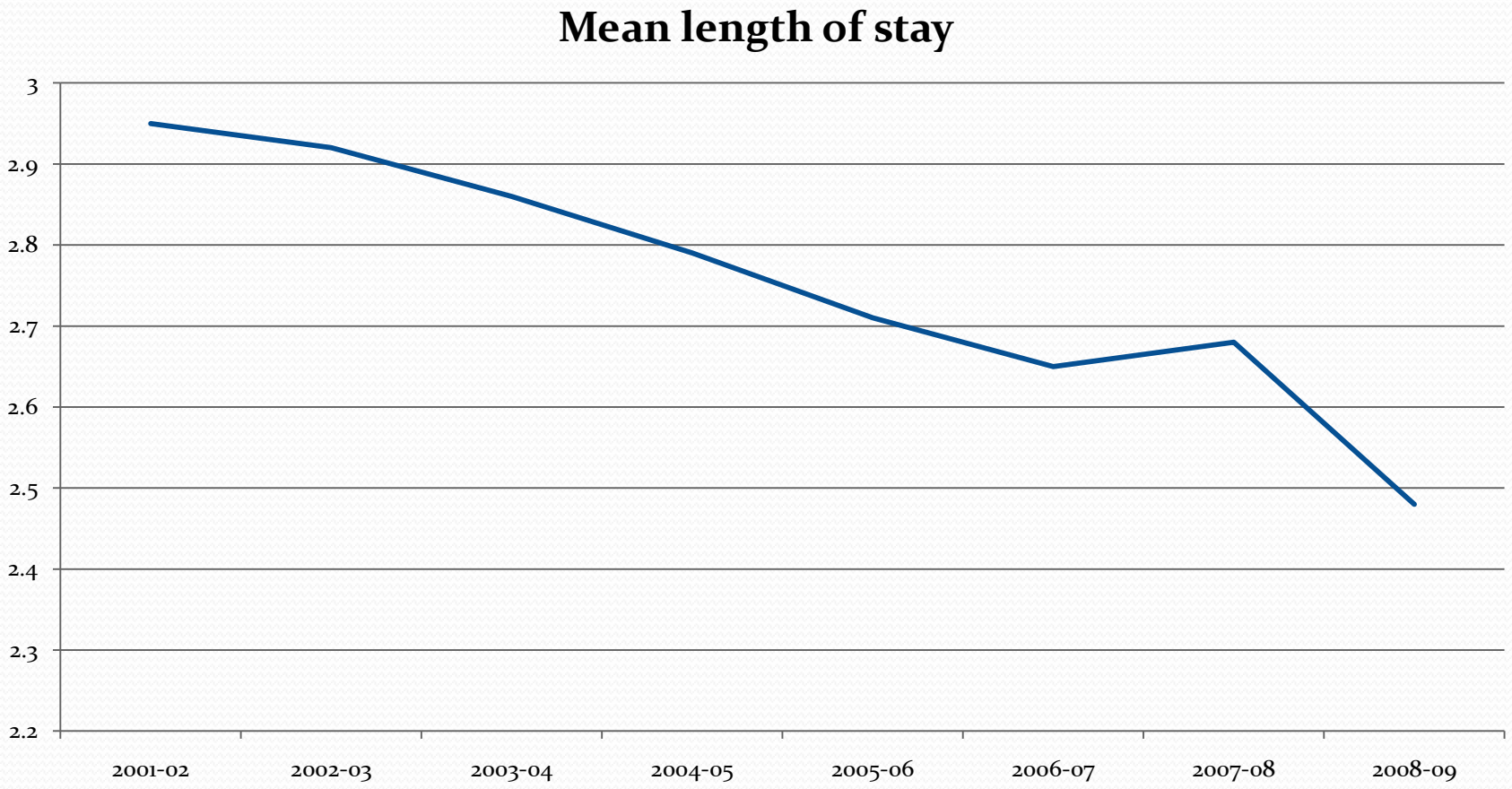
DATA

- Output - **DETAILED**
  - National Minimum Data Set (NMDS) + Others
    - Discharges from all public (and private) hospitals
    - Y_{ijt} - *individual i discharged from hospital j at time t*
      - *j = 1 to 91, t = dates from 2001 to 2009*
    - Y_i - discharges differ by..
      - Individual characteristics (age, sex, deprivation, etc.)
      - Cause of admission (ICD-9, 10)
      - Factors reflecting hospital experience – length of stay, mortality, post-OP sepsis, etc.
- Input data - **LIMITED**
  - Limited temporal dimension
    - Bed capacity of hospital j (derived from NMDS)
    - FTE (HWIP) – at best quarterly
    - Linked Employer-Employee Dataset (LEED) – for labor counts
    - Household Labour Force Survey (HLFS)
    - Census

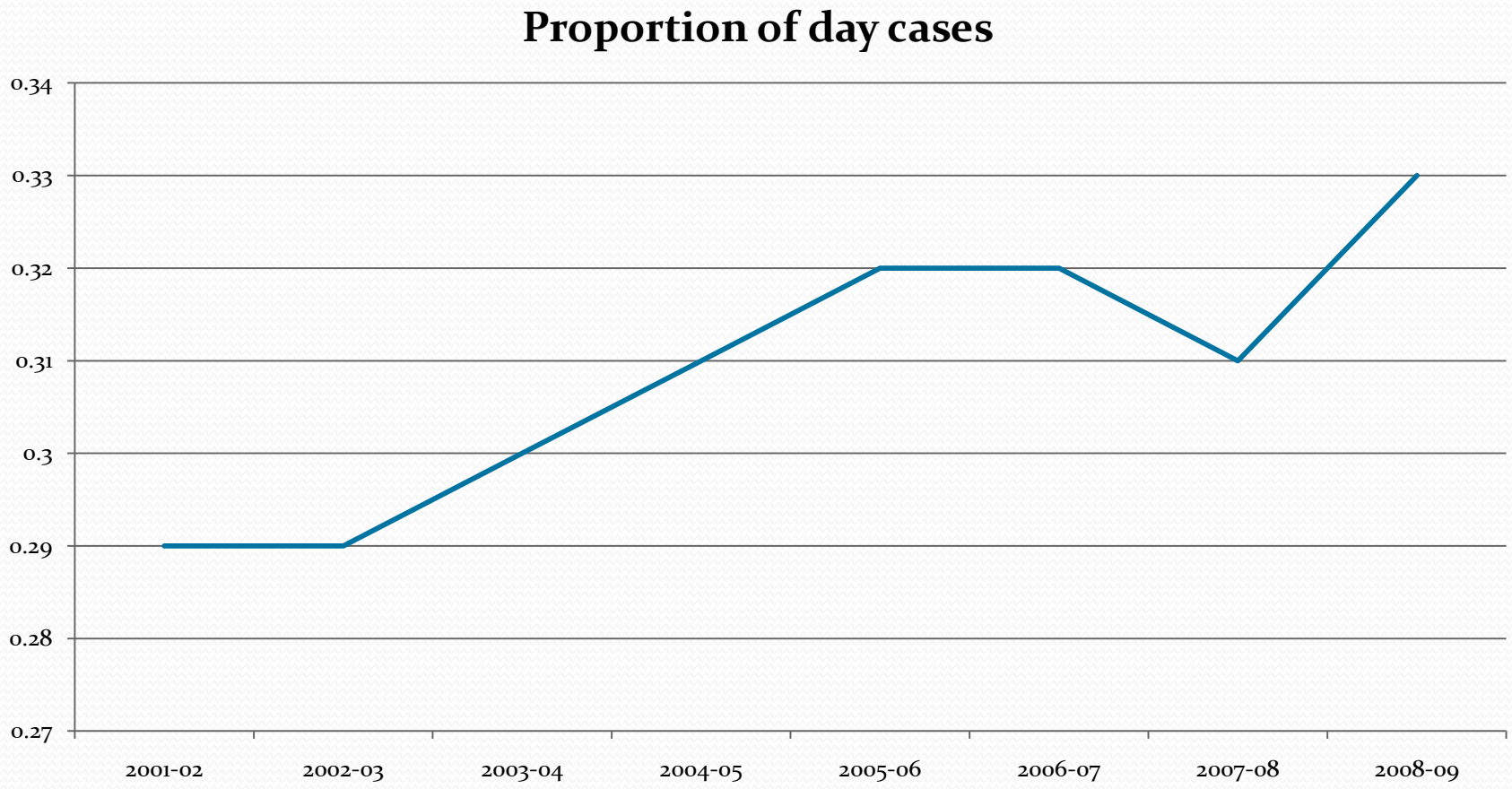
Productivity – Possibilities

- Limited input data
  - Quarterly FTE + financial reports + bed capacity – available sources
    - At best quarterly productivity indices
      - More suited for temporal comparison than spatial differences
- Funding cycle's implications for resource allocation
  - Hard & soft constraints – what interpretational value?
  - Does within-financial year variation reveal anything about resource allocation differences?

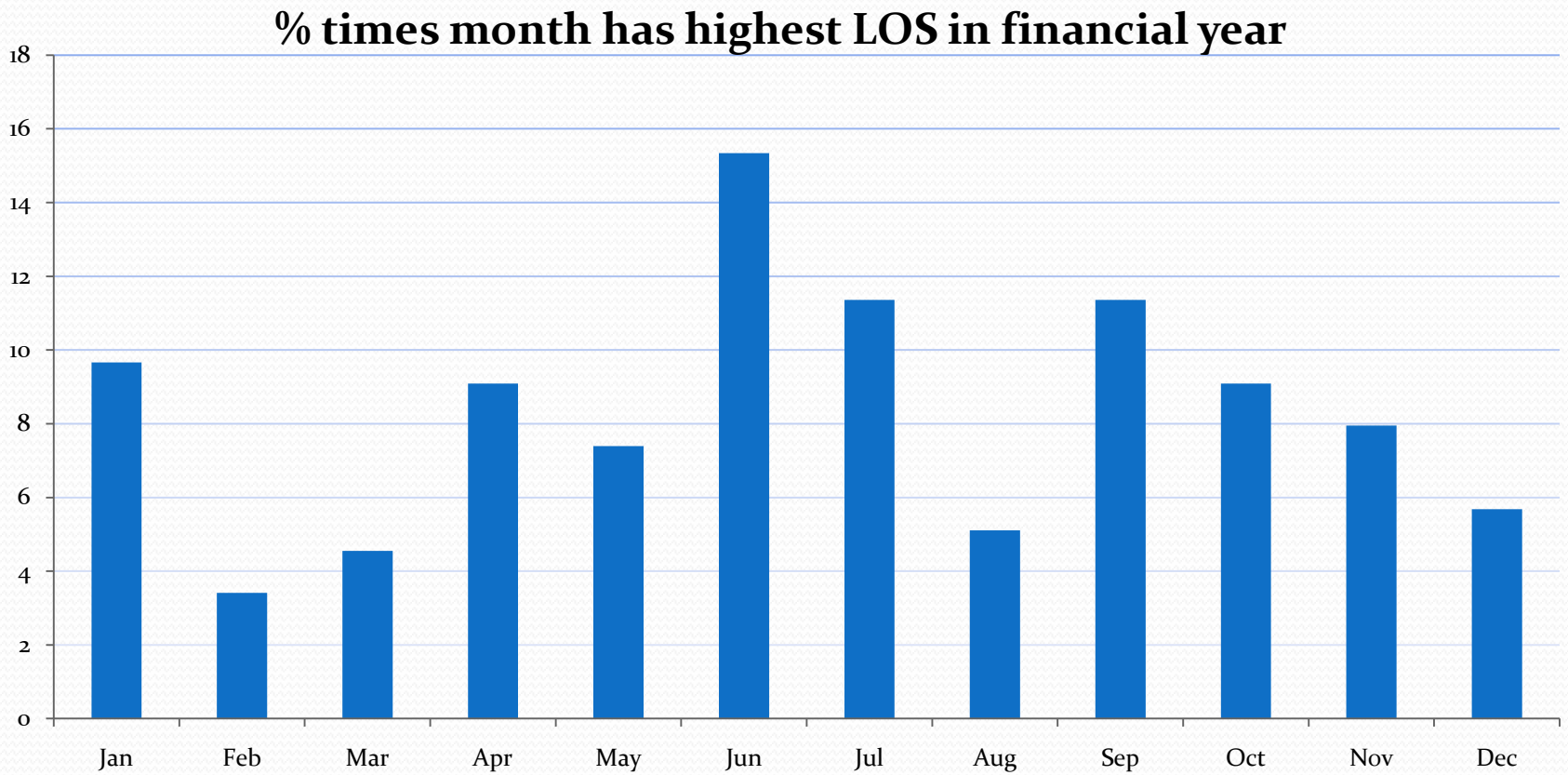
Output Indicators - LOS



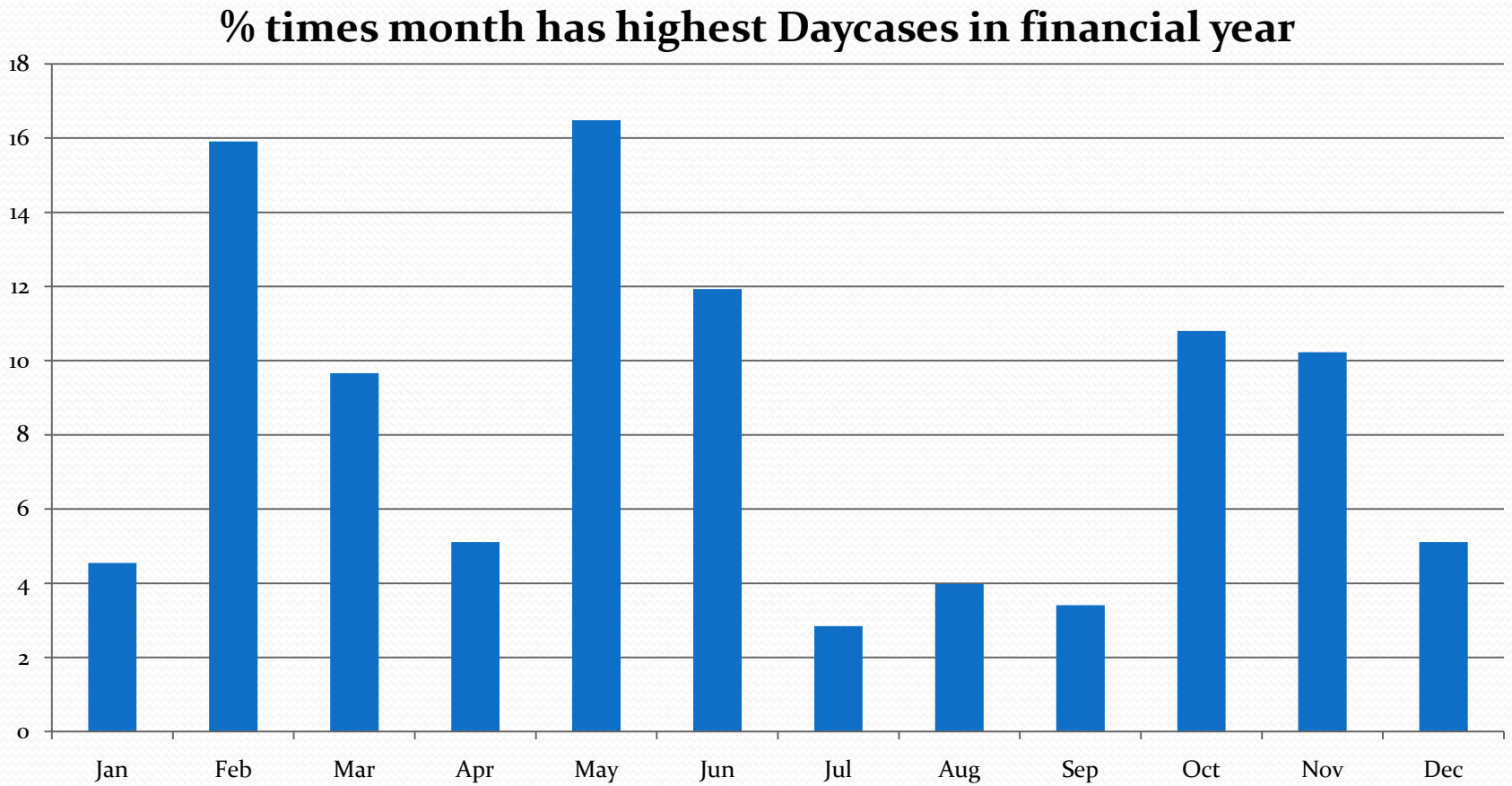
Output Indicators – Day Cases



Variation within a year - LOS



Variation within a year - Daycases



Road ahead

- Quarterly productivity indices
  - Output index
    - Case-mix adjustment (DRG weights?)
    - Combining output indicators: day cases, EDs, length of stay, inpatient stays (#) using fixed weights
    - Quarterly (at best)
  - Input index
    - Bed capacity – based on NMDS (concurrent stays)
    - FTEs – quarterly from HWIP
- Quality adjustment
  - Possibly using Principal components – to combine Patient Safety indicators

Variation in productivity

- Multi-level modelling (MLM) of variation in quarterly productivity indices
  - Controlling for client population characteristics
  - Primary focus
    - Temporal variation
    - Spatial differences (across DHBs)
- Functional form
  - Discharge-level analysis with MLM
    - more n, lower standard errors
  - Hospital-level
    - smaller n, more conservative standard errors