

EMERGENCY DEPARTMENT PATIENT FLOW MODELLING

FOR MIDCENTRAL DISTRICT HEALTH BOARD

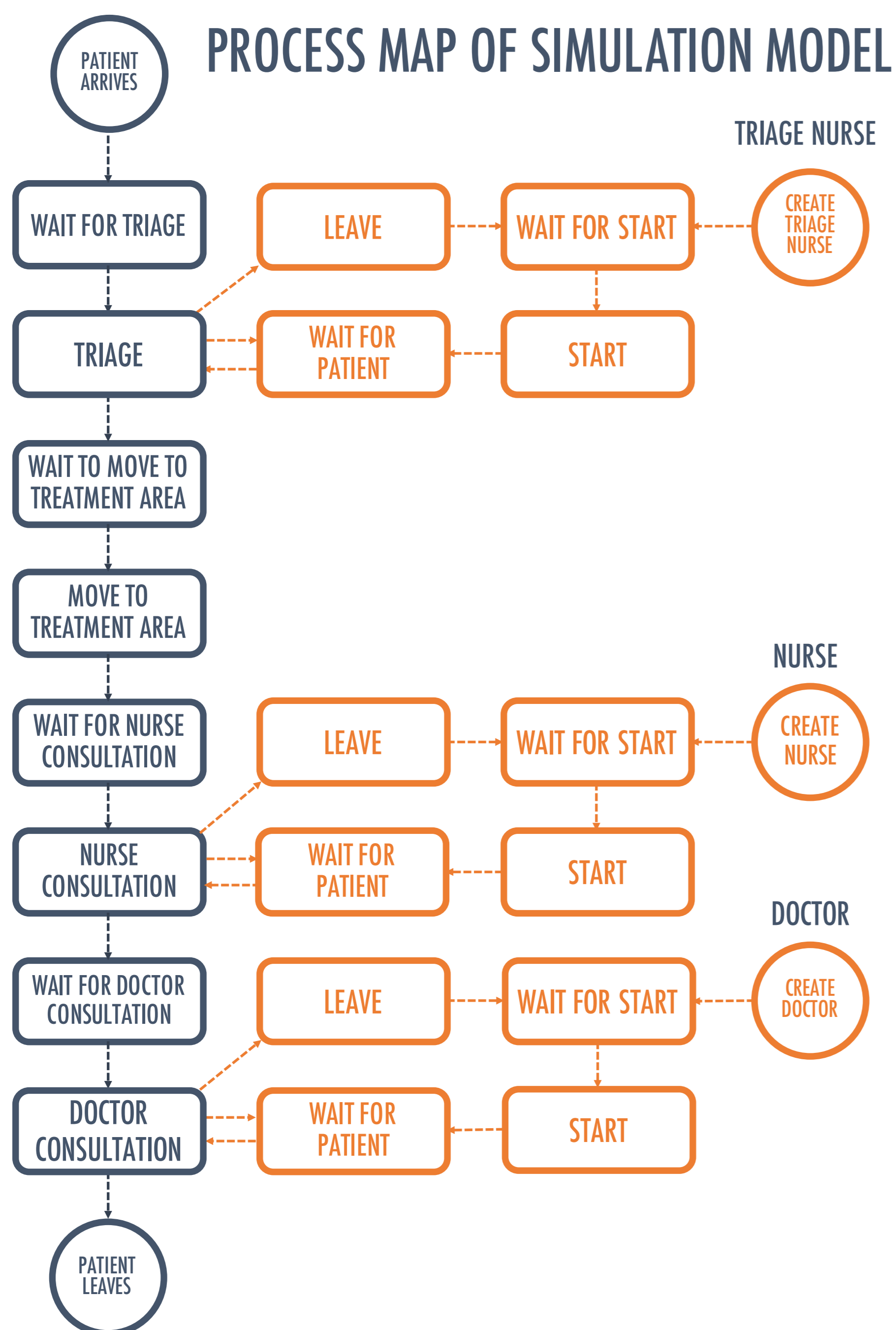
PROJECT AIMS

1. Build a simulation based on historical data to have a thorough understanding of the patient pathways through the ED
2. Use the simulation to explore how possible changes in patient flow and resourcing affect the ED's performance

SIMULATION MODEL

A simulation model was developed using the Hierarchical Control framework and implemented in C# using the Hierarchical Control Discrete Event Simulation Library, written in Visual Studio.

- Simulation runs were conducted using samples taken from the empirical distribution
- Service times for triage, nurse and doctor consultations were estimated



CONCLUSIONS

A successful tool was developed to help with ED resource planning and provides sufficient grounds to recommend the addition of a single nurse. However, further processes can be added to the simulation:

1. Incorporation of cyclic nature within treatment periods
2. Investigation of effects of arrival and departure modes
3. Dynamic patient prioritisation

PROJECT DESCRIPTION

In May 2009, the New Zealand Government published the Shorter Stays in Emergency Departments health care target, which stated that:

“95% of patients will be admitted, discharged or transferred from an ED within six hours”

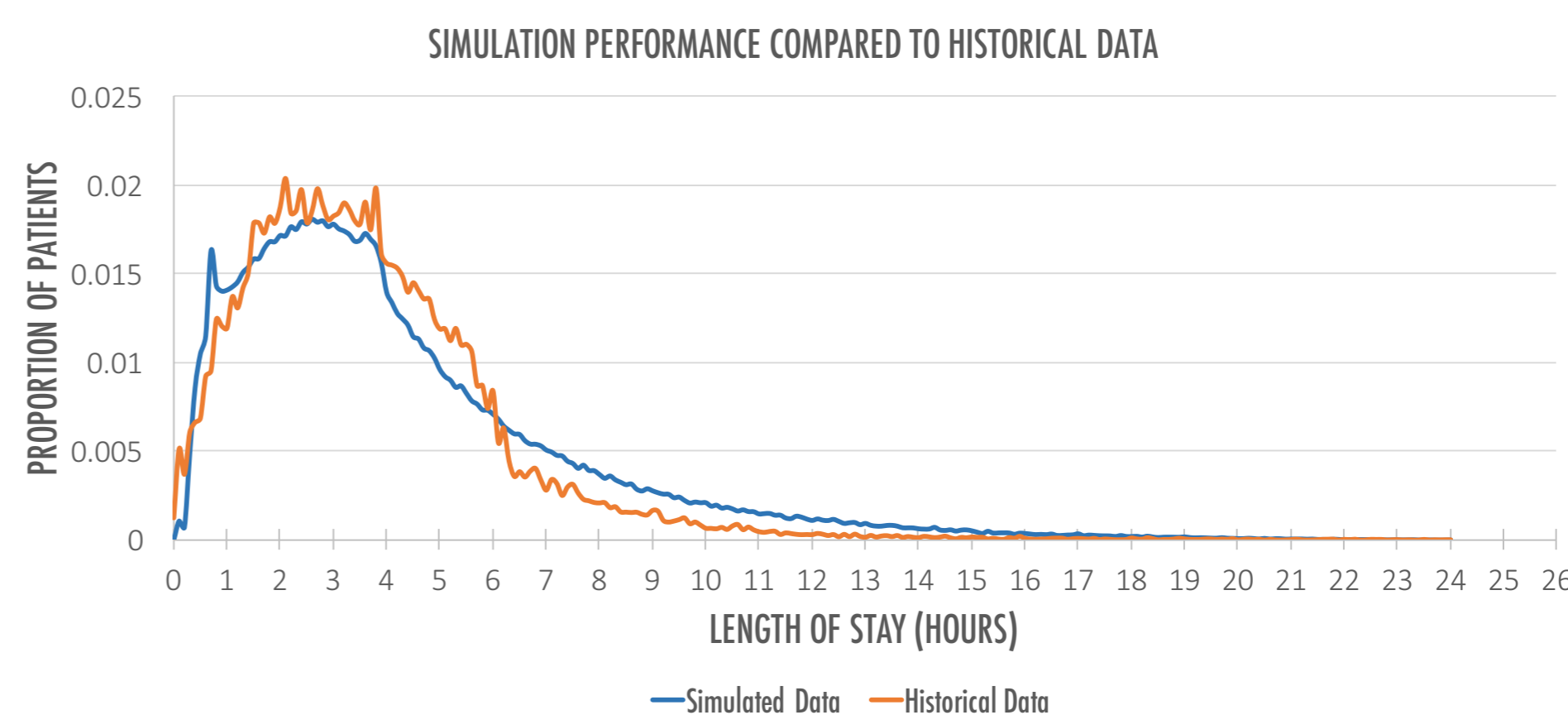
The driving force behind the initiative were the clinicians who had linked long stays in EDs to overcrowding, and decreased patient comfort and satisfaction.

This project studies the patient flow and length of stay distributions of the emergency department in Palmerston North, which operates under MidCentral District Health Board.

CALIBRATION PROCESS

One of the major issues in this project was the lack of data describing the length of time a nurse or doctor spent with a patient.

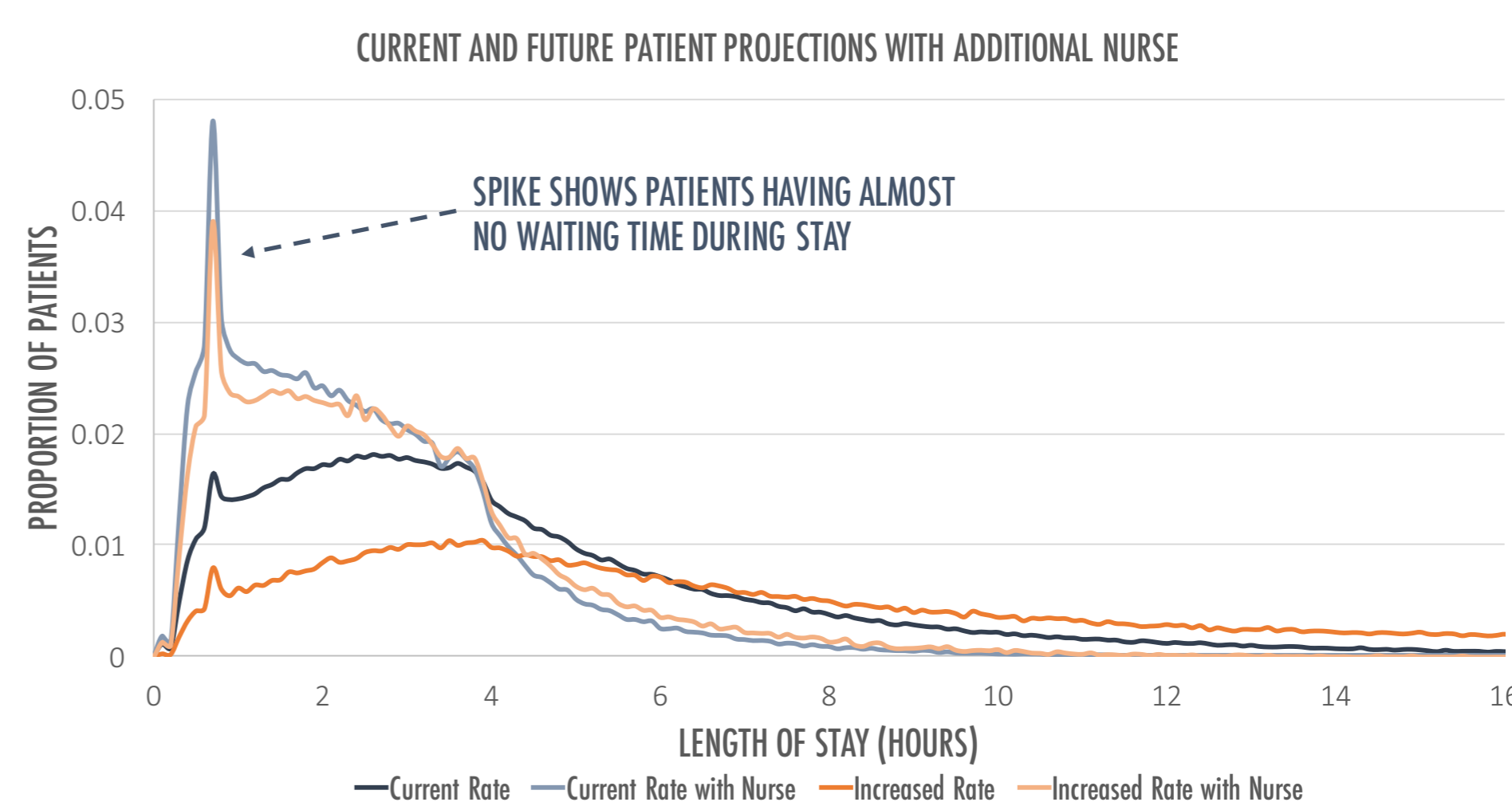
- Consultation times had to be estimated and calibrated until the simulated length of stay distribution matched that of the historical data
- These consultation times were used to test different circumstances in the ED



RESULTS

The simulation was used to emulate four scenarios that the Palmerston North ED could face in the near future. These are:

1. The current patient arrival rate
2. The patient arrival rate increased by 5%, occurring within the next ten years
3. The current patient arrival rate with an additional nurse
4. The increased patient arrival rate with an additional nurse



FUTURE DEMAND WITH CURRENT RESOURCING

- Patients treated within six hours dropped from 80.2% to 40.9%
- A large number of non-urgent patients had length of stays over 12 hours, due to less urgent patients being delayed until no other urgent patient required treatment

EFFECTS OF AN ADDITIONAL NURSE

- For the current patient arrival rate, the proportion of patients leaving the ED within six hours increased from 80.2% to 97.9%
- For the projected patient arrival rate, this figure increased from 40.9% to 94.8%