UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

PREDICTING THE SECONDARY INFECTION FOR AIRBORNE TRANSMISSION OF COVID-19 INFECTION IN BOEING B737-800 PLANE: BASED WELLS-RILEY APPROACH

P42S22

NUR AMIRA NADIA BINTI MOHD ALI (2021119855)
AINI SAHIRA BINTI MOHAMAD RAZALI (2021132165)
SITI ADIBA BINTI MAHASAN (2021103367)

Report submitted in partial fulfilment of the requirement for the degree of
Bachelor of Science (Hons.) (Mathematics)
College of Computing, Informatics and Media

FEBRUARY 2023

ACKNOWLEDGEMENTS

IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL

Alhamdulillah. Thanks to Allah S.W.T, whom with His willing giving me the opportunity to complete and giving us the strength to complete this study successfully.

We would like to express our deepest thanks to our supervisor and co-supervisor who had guided a lot of task during two semester session 2022, Madam Nur Intan Syafinaz binti Ahmad and Miss Nurhazirah binti Mohamad Yunos for their enthusiasm, patience, insightful comments, helpful information, practical advice and unceasing ideas that helped us tremendously at all times in this study. Their immense knowledge and profound experience has enabled us to complete this study successfully. Without their support and guidance, this study would not have been possible. We could not have imagined having better supervisors in our study. We also want to thank the lecturers and staff of UiTM Seremban 3 for their cooperation during the final year study that had given valuable information, suggestions and guidance in the compilation and preparation of this study.

Deepest thanks and appreciation to our parents and family for their cooperation, encouragement, constructive suggestion and full support for the report completion, from the beginning till the end. Lastly, thanks to all of our classmates and everyone that has contributed by supporting our work and helping us during this study progress till it is fully completed.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

This study are mainly about estimating the potential risk of Covid-19 infection among passengers on Boeing B737-800 aircraft. The aim of this study is to calculate secondary infection for Covid-19 virus in the Boeing B737-800 aircraft due to airborne transmission. Aircraft are preferred over other enclosed spaces like trains and buses because they require passengers to spend longer time in the enclosed spaces during flight without any interruption between the journey. A major risk to passengers in a cabin could be posed by massive droplet and airborne transmissions given the high density and close proximity of passengers. An aircraft with passengers in a cabin would increase the risk for infected people becoming more frequent since it has a high occupant density but limited fresh air supply. The Wells-Riley model is used in this study because it is appropriate for populations in confined spaces and it has been frequently used for quantifying the infection risk assessment of infectious illnesses in indoor settings. In this study the secondary risk of infection is calculated for every susceptible passenger flying for one, two, three and four hours journey. Based on the finding, it is found that the relationship between exposure time and number of infected people are positive linear relationships. This means that the longer time a passenger is exposed to the infected people in the cabin, the higher chance of the passenger getting infected by the virus. The reproduction number is estimated to be 2 passengers when the exposure duration is less than 2 hours for 80 passengers or less than 1 hour for 166 passengers. This estimation indicates that the risk of secondary infection is not under control and the reproduction rate of secondary infection is high. Based on Olsen, 2003, if the value of secondary infection are greater than 1, a disease may grow in the environment, whereas if the secondary infection are less than 1, it will indicate that the infection is under control. Therefore, it can be concluded that there is a high chance passengers may get infected in the aircraft and the risk will increase when the exposure time is increasing. The best alternatives for protection against large droplets and direct contact transmission for the passengers are wearing mask and face shield, social distancing and sanitising hands frequently. An improvement in ventilation seems to be effective and feasible to prevent Covid-19 infection.