Modelling in Public Health Emergencies

**How transmissible is a virus?**

Imagine you are infected with a virus (e.g. SARS-CoV-2)  
• Assume you know people in your social network  
• Of whom you come into contact with a proportion while you are infected  
• For each there is a probability of virus transmission  
• Each time you ‘try’ to transmit, probability the host is infected is h. Then you infect on average

is expected num of people a single infected person will infect in an otherwise fully susceptible population.

Final attack size ->

To stop covid short term, must reduce the transmissibility by > 50%.

Time Course of Infection

SARS: incubation time = latent period, can just isolate sick people Covid: latent period is shorter, find sick people is too late HIV both are so long (4 decades), but covid serial interval is much more shorter (<14 days) so it’s gone faster

**Incubation period:** Hiding stage (have first symptoms)

**Symptomatic period:** Feeling sick stage

**Latent period:** Carrying the disease silently

**Infectious period:** Spreading the disease stage

A diagram of a person's cycle

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**A diagram of a person's life cycle

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**A diagram of a person's life cycle

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You can be asymptomatic and still contribute to transmission before onset/throughout their infection period.

**Epidemic curves / trajectories for two countries for  
COVID-19 in 2020**

• Cases are people who have been identified to  
have the infection. Cases Infections  
• But what counts as a case?  
• **Incidence** is the number of new infections or new cases  
• **Prevalence** is the number of current infections,  
cases or severe cases, or the number of people who ever were infected or a case   
• **Seroprevalence** is those with markers in the blood of past infection

If R0 = 2

As time goes on, more and more contacts have already been infected and they are “wasted” for the virus. If behaviour does not  
change, the effective ℛ at time t is = x portion still susceptible.

A diagram of a graph

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A diagram of a number of vaccinations

Description automatically generated

**• Herd immunity is a natural fact with any infection**  
• Even moderately infectious pathogens will infect a large fraction by the time herd  
immunity is reached unless vaccination can be implemented (leading to vaccine  
induced herd immunity)  
• Should not confuse it with a herd immunity ‘strategy’  
• **Herd immunity is transient**  
• When an epidemic wave peaks, for that degree of control measures, herd immunity has been reached  
• Yet new waves may follow soon after as immunity wanes  
• This is why pandemics usually segue into endemics

is how long you are ill

A diagram of a mathematical equation

Description automatically generatedA diagram of a mathematical equation

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**Compartmental models** simplify reality in numerous ways:  
• People aren’t homogeneous  
• Time spent in each state isn’t the same  
• Not well suited for some problems e.g. when we want to estimate risks  
• Randomness can divert epidemic trajectories  
But these models are fast and scale well for large outbreaks.

**Process of modelling in public health**

What is the problem we are solving?

*(Necessary complexity of the model)*

What are the processes underlying the disease?

*(What must be accounted for?)*

Design structure of model

*(How is the population represented, and how does the system change?)*

What is known about these processes?

*(How fast are/what determines changes?)*

What data are there?

*(For estimating parameters and validating results)*

Running model

*(Coding, debugging)*

Communicating results

*(Reducing the data to graphs or tables/ limitations and assumptions)*

**Models of Dengue**

DENV spreads from A → B → C → D → ... at rate β × p ( susceptible)

A diagram of a border control

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A diagram of a graph

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Case/Border I: Simple analysis of Border Policy

Aim: Quantify then protection by 14 days quarantine vs no quarantine vs testing and other comb.

Motivation: Demonstrate that Asian/Pacific style border control should be considered

Typology of Border Control S1 Enter/ S2 PCR+ → 7 iso/ S3 PCR+ → 14 iso/ S4 7Q/ S5 14Q

Tested by simulate if go through this control, how many will leak?

Case/Border II: Bigger analysis of Border Policy

Risk of source country + Border Policy→Simulate→Calculate Risk (#Missed, DR0) →Risk Budget

Weakness: assume that all test result are independent (IMO, outcome is sensitivity each t day)

Risk Budget: +Longer Q = -%Missed; PCR higher sensitivity

Case III: Vaccination Roll Out

After ended border control and social reopening > prediction said the infection rate will JUMP!

Need to plan for vaccines > SG (vaccines listed and use started→roll out→delta out→change dose timing→booster rolled→omicron) | MOH (impact of lifting control measures w/o updated VE, <12 age, boosters, 5mo boosters instead of 6mo, omicron) | Model Development

(start→simulation impact of rollout in diff groups→update time btw dose→update VE as new evidence emerge→fit to case&ICU data→update w/boosters diff time→update w/omicron)

Humanitarian Emergencies

**1. Definitions and Characteristics of Disasters**

**2. Determinants of Disaster Risk**

**3. Humanitarian Coordination Architecture**

**4. Disaster Management Cycle**

Humanitarian Emergencies Definition

“An event or series of events that represents a critical threat to the

health, safety, security or wellbeing of a community or other large

group of people, usually over a wide area.”

(Humanitarian Coalition)

• **Types:**

o Natural (earthquakes, floods, hurricanes, volcanoes, landslides, wildfires etc)

o Man-made (conflict, environmental degradation, pollution, industrial

accidents)

o Complex (disaster + conflict/political instability)

**Characteristics of Disasters**

1. Large displaced population

2. Population usually settled in temporary locations

• High population densities

• Inadequate food/shelter

• Unsafe water

• Poor sanitation

• Infrastructure compromised or destroyed

3. Increase risk of transmission of “epidemic-prone diseases”

(mainly infectious diseases) → increase mortality

**Determinants of Disaster Risk**A diagram of a risk

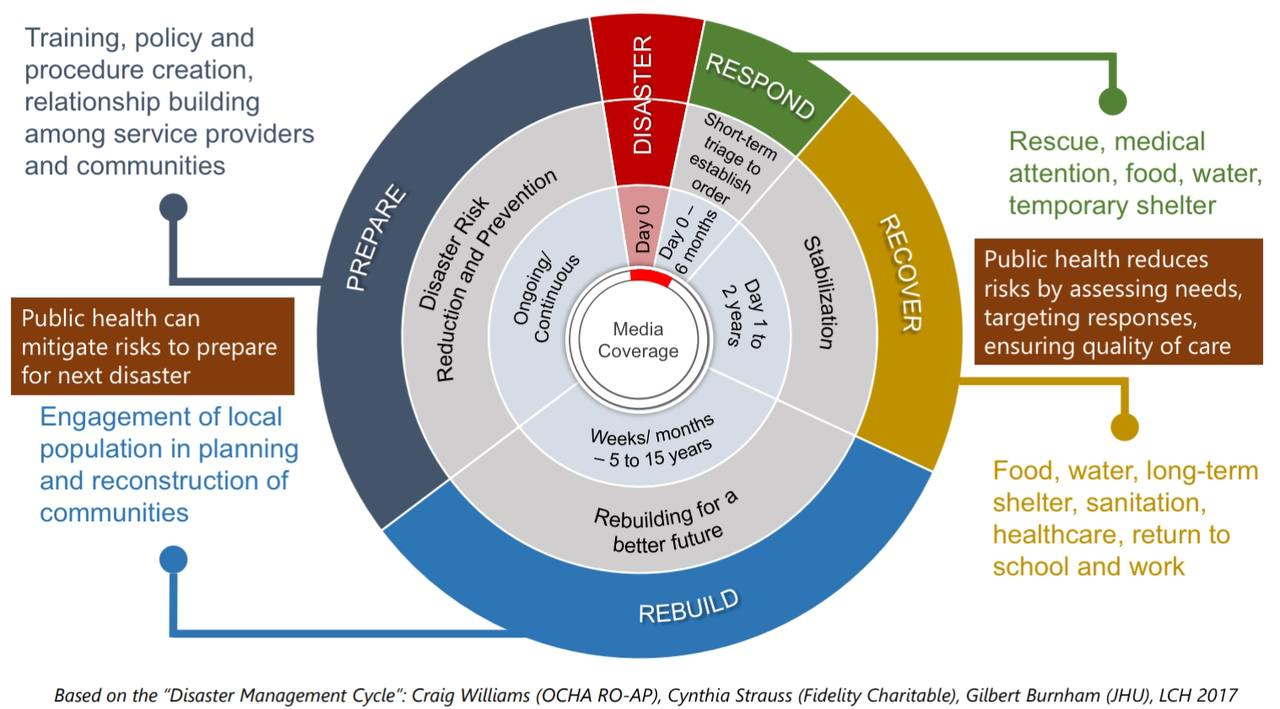
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**Humanitarian coordination architecture**

*A diagram of a disaster response

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**Disaster Management Cycle**



Prepare [ongoing/continuous] (Disaster risk reduction and prevention) Training, policy and procedure creation, relationship building among service providers and communities & Public health can mitigate risks to prepare for next disaster, Disaster [Day 0], Respond [Day 0 to 6 months] (Short-term triage to establish order) Rescue, medical, attention, food, water, temporary shelter, Recover [Day 1 to 2 years] (stabilisation) Food, water, long-term shelter, sanitation,

healthcare, return to school and work & Public health reduces risks by assessing needs, targeting responses, ensuring quality of care, Rebuild [weeks/months – 5 to 15 years] [Rebuilding for better future) Engagement of local population in planning and reconstruction of communities

Response Phase

• Emergency Classifications (IASC/IOM)

• Level 1: National Emergency Response

• Level 2: Regional Emergency Response

• Level 3: Global Emergency Response

• Based on:

1. Scale

2. Urgency

3. Complexity

4. Capacity

5. Reputational Risk

A diagram of a rapid assessment

Description automatically generatedIntroduction to Global Intervention

**Black Death (1300-1600)**

Started when habitats of wild rodents in Central Asia disrupted by human/farming expansion/new trading patterns

• 1348- (Venice):

o Believed that plague came by ships

o Adopted 30-day detention period

o Expanded to 40-days (i.e. “quarantine”)

o Island as quarantine station (lazaretto)

o Didn’t work (spread by fleas on rats)

o Bar exit of people/goods from cities/region

• Public health measures are local and unilateral

**Imperialism/ Colonialism**

**(late 1400s)**

• Transmission of disease in multiple

directions

o Europeans carried influenza, typhus,

smallpox, cholera

o Falciparum malaria from Africa to

Americas via European slave ships

o Syphilis from Americas (early Spanish/

Portuguese explorers) back to Europe…

• High occupational mortality among

displaced indigenous groups, bonded

labourers, African slaves

• Decision to counter infectious

diseases (“tropical diseases”) based

on external interests:

o Protect health of European and

American colonial personnel and

workers o Enhance productivity, safeguarding

commerce

o Top-down, local compliance was

achieved through compulsion

o Narrow focus (on single disease)

**International Health (1850s)**

Fear of epidemic:

• Large-scale immigration from Europe and Asia to the

Americas

• Explosion of mineral extraction, manufacturing, trade,

marketing of goods + revolution of transportation

(steamships, railroads, Suez Canal)

• 6 cholera pandemics between 1816-1899

On-the-ground cooperation deemed as beneficial for:

• Control of outbreaks (of tropical diseases)

• Stabilise colonies and emerging nation states

• Improve diplomatic relations

• Expand consumer markets

• Encourage transfer and internationalising scientific,

bureaucratic and cultural values

**International Health (1900s)**

• International Health Organisations (e.g. Rockefeller Foundation – “scientific philanthropy”, Save the Children, League of Nations Health Organisation)

(post-WWII)

• De-colonisation

• UN, World Bank, IMF, WHO

**Global Health today**

Focused on “improvement of health worldwide, the reduction of disparities, and protection of societies against global threats that disregard national borders.”

|  |  |  |  |
| --- | --- | --- | --- |
| **Factor** | **Public Health** | **International Health** | **Global Health** |
| **Focus** | Health of a community or country | Health issues in other countries (low-mid income) | Health issues affecting populations worldwide |
| **Level of Cooperation** | Does not usually require global cooperation | Usually requires binational cooperation | Often requires global cooperation |
| **Individuals vs Populations** | Focuses on prevention programs for populations | Prevention in individuals and clinical care | Works on both prevention in individuals and clinical care |
| **Access to Health** | Equity within a community is a major goal | Aims to help people from other countries | Equity among all nations and for all people is a major goal |
| **Range of Disciplines** | Encourages a multidisciplinary approach within health sciences | Uses a few disciplines from health sciences | Highly interdisciplinary, including beyond health sciences |

**Key Elements of Global Health**

1. Transcends national boundaries

2. Requires global cooperation

3. Prevention and clinical care

4. Health equity for all

5. Interdisciplinary, multidisciplinary within and beyond health sciences

**Equity** is the absence of avoidable or remediable differences

among groups of people, whether those groups are defined

socially, economically, demographically, or geographically. (WHO)

**Health inequities** are systematic differences in the health status or

in the distribution of health resources between different

population groups, arising from the social conditions in which

people are born, grow, live, work and age. (WHO)

**Facts**

Children under five in sub-Saharan 14 times more like to die than the rest of the world

Lifetime risk of maternity death: Sweden = < 1 in 10,000, Chad = 1 in 16

Life Expectancy: Japan = 84 years , Sierra Leone = 50 years HIV in the US: African American represents 13% of the population but 48% of all new infections

**Proportions Contributing to premature deaths in the US**

Behavioural patterns 40%, Genetic predisposition 30%, Social Circumstances 15% , Health care 10%, Environmental Exposure 5%

**Myths and Assumptions of Global Health Programmes**

**1. Expertise gradient**

• “We have superior understanding about how best to identify, prioritise and

solve pressing health problems somewhere else.”

• “Problems elsewhere are simpler than problems at home.”

**2. Accountability**

• “As long as the intention is to help – global health interventions need not be vetted by the individuals and communities they are intended to help.”

**3. Equity vs Inefficiency**

• “Interventions and programmes motivated by concerns for equity and solidarity do not need to consider efficiency.”

A diagram of health and social characteristics

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Public Health Genomics

**What is a Genome**

All living organisms have distinct genomes,

which contain “instructions” to create an

organism, encoded in chemicals known as

“DNA” of letters adenine (A), guanine (G),

cytosine (C), and thymine (T) or “RNA” of

letters adenine (A), guanine (G), cytosine (C),

and uracil (U)

A screenshot of a chart

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A screenshot of a computer

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**Genetics**

Genetics is the study of genes, genetic variation and heredity (traits passed from parents to offspring)

*CFTR gene -> cystic fibrosis transmembrane conductance*

*regulator protein*

*Disease-causing mutations in CFTR gene disrupt normal*

*production of protein*

Cystic fibrosis (CF) is an inherited disorder

that causes sticky mucus to build up in the

lungs, digestive system and other organs in

the human body. It causes difficulties in

breathing and increases risk of infections.

**Complex traits and diseases:**

1. Height

2. Cholesterol levels

3. Type 2 Diabetes

4. Cancers

**National Genomic Sequencing Projects**

Aims:

1. Determining normal genomic variation 2. Determining pathological genomic variation (clinical cohorts such as

rare diseases, cancer, complex diseases, etc.), 3. Infrastructure, and 4. Facilitating personalized and

precision medicine

Genetic effects have varying degrees

Genetics: Some diseases are strictly by genetic causes like cystic fibrosis and down syndrome

Environment: Being knocked down by car, nothing to do with genes

Height, cholesterol levels, type 2 diabetes and cancer is due to both environment and genetics

Human Genome Project

Goal to sequence entire human genome, find what genes present and where they’re located

Tech has improved now, can do it in 1 day for only 1.2k Machines more powerful and getting much smaller

Latest sequencer just slightly larger than usb thumbdrive

Cost *lower these days*

**Precision Medicine: Hope to achieve**

• accurate prediction of health conditions

• hopefully pre-empt the health condition from happening and act before it’s too late

• faster diagnosis

• Identify causes of rare diseases and hopefully accelerate the search for potential treatments

• optimised treatment

• Patients can receive the right treatment at right time, improving efficacy and reducing side effects

• novel treatments

• Understand mechanisms of conditions to inform development of novel drugs and treatments

**Precision medicine considers**

• individual variations in genetics/genomes,

• environmental and lifestyle factors

to more accurately predict which treatment and prevention strategies will work in different groups

of people.

**New-born Screening**

***Diagnoses of rare Mendelian disease in children***

• Patient developed the symptoms consistent with Crohn-disease- like illness

• Age and severity suggested underlying immune defect

• Despite comprehensive clinical evaluation (results were normal

for tests for known genetic defects), unable to arrive at a definite

diagnosis, thereby restricting clinical management

• Sequenced his genome (exome) and identified 16,124 variants

when compared with the human genome reference sequence; of

which 1,527 were novel after comparing with dbSNP

• Found a mutation in the gene XIAP on X-chromosome, which had

previously been linked to immune deficiency but not previously

associated with Crohn disease

• Performed cord-blood transplant, where child subsequently

recovered.

**Predictive Testing for Cancer**

Analysis of clinically relevant variants from ancestrally diverse Asian genomes | Nature Communications18

• Women with the BRCA (breast cancer) genes mutation are five times more likely to get

breast cancer and 30 times more likely to get ovarian cancer than others.

• Screening for BRCA genes mutations in the general population is probably impractical, as it

probably account for less than 5 per cent of all breast cancer cases

**Pharmacogenomics**

Use of genetic and genomic information to tailor pharmaceutical treatment

Pharmacogenomics on Epilepsy & Bipolar disorder Epilepsy – a common neurological disorder affects central nervous system Around 50 million

people worldwide have epilepsy | More than 20,000 Singaporeans are affected by it

Drug: Carbamazepine (CBZ) Used to treat epilepsy and bipolar disorder | Fairly inexpensive and

generally effective | But may cause potentially life-threatening side effects of Stevens-Johnson Syndrome | A highly significant association HLAB1502 and steven johnsons syndrome | A lot

more common in Asians | Gov issued health advisory that must undergo genotyping to identify if patients have HLBA1502 | Cost effective to perform genotyping on all epilepsy patients, then prescribe CBZ to those that test negative instead of avoiding CBZ entirely

**Genomic Epidemiology**

**Epidemiology:** study of the distribution and determinants of health-related outcomes in a specified population and the application of this study to control health problems

**Genomic Epidemiology:** use of genomic data to determine the distribution and determinants of health-related outcomes in a specified population and the

application of this information to control health problems

**Flagging the presence of the virus:**  
Step 1 is to identify regions of the 2019-nCoV genetic material that are distinct from other coronaviruses (Sars). Step 2 is to collect samples from patient’s lungs, cough, mucus. Step 3 is extract viral RNA and convert to DNA through transcription. Step 4 is to copy genetic material in the sample through temperature changes (increase the presence of the genetic region targeted (hard to detected). Step 5 is to highlight red flags via DNA fluorescing dye. Virality corresponds to more glowing.

**Host Genomics:** Studies link genetic variations to diseases. This shows potential for genetic screening.

**Environment Genomics:** Wastewater surveillance can identify individuals with COVID-19 through viral RNA traces. **Diagnostic:** By identifying the virus as novel, scientists developed PCR tests targeting unique fragments of the COVID-19 virus.

**Genetic Variants:** Mutations in viruses occur during replication. These mutations can be neutral or affect the virus in various ways, including transmissibility, severity, and immune response. This is important for both PCR test accuracy and vaccine efficacy.

**Genetic Epidemiology** - Surveillance: Sequencing the virus allows researchers to: \* Identify if an outbreak is from a single source or sustained transmission. \* Detect new viral lineages and distinguish them from existing ones. \* Inform public health interventions (e.g., border control) by identifying the source of outbreaks.

**Genetic Epidemiology** - Outbreak: By analyzing virus genotypes, researchers can identify the source of infections within a community (e.g., work setting) and implement targeted interventions instead of lockdowns.

Workplace Safety and Health

**1.Introduction to Occupational Health (OH)?**

a multidisciplinary activity aimed at the protection and promotion of the health of workers by preventing and controlling occupational diseases and accidents, eliminating occupational factors and conditions hazardous to health and safety at work, the development and promotion of healthy and safe work, work environments and work organizations, the enhancement of the physical, mental and social well-being of workers and support for

the development and maintenance of their working capacity, as well as professional and social development at work, enabling workers to conduct socially and economically productive lives and to contribute positively to sustainable development

**WORK CAN AFFECT HEALTH**

Accidents and injuries, Obvious diseases, Hidden diseases, Incurable diseases

**HEALTH CAN AFFECT WORK**

Decrease productivity, Danger to self, Danger to others / community

**Evolution of work overtime: the four Industrial Revolutions**

1.0 (1784) Steam power, mechanized production, Child labor common, Hazardous, Little WSH legislation

2.0 (1872) Electric power, internal combustion engine, Age of mass production, New WSH laws, Use of

epidemiological methods to examine causality between work exposures and disease.

3.0 (1969) Electronics, IT to automate, Increased sedentary work, Rising NCDs, Move to integrate

workplace promotion with WSH (e.g. Total Worker Health, Total Workplace Safety and Health)

4.0 (Today) New tech (e.g.nano, additive manufacture, synthetic biology), Changing work conditions (e.g.

24/7, digital, WFH), New employment relationships (e.g. gig economy)

**Demographic of workforce**

• Shrinking workforce due to declining fertility rate

• Rapidly aging population and workforce

• The health of our working population is worse off than

the general population

• Cutting back on foreign manpower

Substance Misuse and Toxicity

Substance Use Disorders (SUDs) are treatable, chronic diseases characterized by a problematic

pattern of use leading to impairments in health, social function, and control over use.

*> a cluster of cognitive, behavioural, and physiological symptoms indicating that the individual*

*continues using the substance despite harmful consequences, inability to control their use*

A close-up of a chart

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Drug-use disorder 35.6M suffer in 2020 | Substance-usedirectly/indirectly > 11.8M deaths

Globally, the number of disability-adjusted life-years (DALYs) caused by DUDs approximately.

increased by 2.6% yearly from 1990 to 2019 < 1 DALY = 1 lost (US 800+ DALY/100k p̂)

WHO strives to address the following Challenges. (\*)

• Ensure access to needed controlled medicines for medical use.

• Prevent and manage harms associated with drug use.

• Providing universal access to effective treatment and care for people with drug use disorder

Part I: Methamphetamine (ice drug)

Surge use in 2015-2019 despite law enforcement: died from overdose change 170%

SG, 22vs23, new drug abuser arrested +18%, total +10%, 30% of arrested are new, 51% age<30

> every abuser drug type increase (a lot of metham.), 63% of new use methamphetamine.

History (\*) Amphetamine was first synthesised in 1887 in Germany by Romanian

chemist Lazăr Edeleanu (2) Methamphetamine was first synthesized in 1893 by Japanese chemist Nagai Nagayoshi (3) Methamphetamine was widely used by German and Japanese soldiers in

World War II for its stimulant effect and extended wakefulness (4) In 1950s, was indicated for treatment of obesity (5) In 1970s, became a controlled drug in US (6) In 1980s, US tighten regulations around the sale and use of ephedrine and illegal drug production turned to using pseudoephedrine as a precursor (7) In 1990s, there was a widespread use of methamphetamines

Effects (\*) Euphoria, increase energy and alertness l Chronic mood & cognitive changes

> irritability, aggression, panic, hallucination, memory impairment

Increased risk of early mortality and suicide attempts l Cardiovascular complications

> arrhythmia, myocardial infarction, heart failure | or else, stroke

Prevention and Treatment in Singapore (\*)

Legal Enforcement Illegal to consume in/out SG (Misuse of Drugs Act, Class A controlled drug)

Screening & Assessment prompted by signs/symptoms from patient’s presentation, history

and/or physical examination.

Drug testing urine, saliva, blood, hair

Diagnosis DSM-5 diagnostic criteria (diagnostic & statistical manual of mental disorders)

Management Psychosocial interventions largely (Motivational interviewing, Drug counselling, Cognitive-behavioral therapy)

Preventive drug education (PDE)

A diagram of a diagram of a child

Description automatically generated with medium confidence

Prevention of drug misuse in Singapore

A table with text on it

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Part II: Alcohol

Alcohol use disorder is the most prevalent mental disorder globally (Russia highest, 15-20%)

Risk factors > drink at early age, family history, mental health condition/trauma

Effects

5.1% of the global burden of disease and injury is by alcohol, as

measured by DALYs, Causal link and risk factor found in more than 200 diseases and injury

**Alcohol consumption centered**

**approaches (\*)** Reduce population

level consumption by: Raise alcoholtaxes | Raise the minimum price of alcohol sold at retail | Raising legal minimum drinking age | Reduce permitted hours for sale of alcohol late at night | Advertising restrictions

**Injury centered approaches** (\*)

reduce alcohol-related road injuries by:

Publicity campaigns | Police enforcement of drink-driving laws fines, driving license suspension etc. | Random breath testing | Ignition or alcohol interlock devices

Prevention and Treatment in Singapore (\*) • Legal Enforcement +18 y/o, driving > 30 mcg/100ml breath, 80 mg blood > S$10000&/ 1y jail

> > Ignition interlock devices (breath alc) > 🇧🇪 🇩🇰 🇫🇮 🇫🇷 🇳🇱 🇵🇱 🇸🇪 🇦🇹

Injury centered approach reduce interpersonal violence by: Reduce trading hours for licensed

venues & Improve venue security.

2 standard drinks per day for men and 1 standard drink per day for women (beer can 330ml 5%/ half glass wine 15cm 5% / spirit nip 30ml 40%) men .bodyfat alc

dehydrogenase enzyme

Screening and assessment Patient’s alcohol history | physical examination on potential comorbidities and complications | laboratory investigation;

Diagnose DSM-5

Management Patient education on drinking limits and law | Psychosocial interventions | Consider referral to community resources or psychiatric services where appropriate.

Part III: Opioids

Effects (\*)

Reduce pain, act on opioids receptor in brain&/spinal cord for Analgesia, Cough suppression, Sedation, Respiratory depression, Euphoria.

By Friedrich Sertürner, opium poppy > overdose death wave1 1999 opioids (natural, methadone) | wave2 2010 heroin | wave3 2013 synthetic opioids (tramadol, fentanyl)

Symptoms Constricted pupil, Breathing difficulty, Unconsciousness, May have seizures

Management Antidote: Naloxone (opioid antagonist), Supportive care: breathing & ventilation

Opioid withdrawal Sweating, Bone aches, Runny nose, Tremor, Restlessness, Anxiety/irritability

Management Pharmacological: Buprenorphine/Naloxone, Symptomatic management

Prevention and Treatment in Singapore (\*)

Prevent misuse, +opioid dependence treatment, . -inappropriate opioid, monitoring opioid prescribing and dispensing, limit inappropriate over-the-counter sales of opioids.

SG: Legal controlled drugs, need license, bring in need HSA, no supply retail of codeine cough

Prevent misuse SG: X first line treatment for acute pain, identify risk, monitor, education.

**QUIZ**

**Which one of the following best describes substance use disorder?**

It is a mental condition to which a person is unable to control the use of substances.

**\_\_\_\_\_\_\_\_\_\_\_\_\_ is an alcohol consumption centred approach to reduce and manage alcohol use disorder in the population.**

Increasing the fine for drink driving offenders. Raising the legal minimum drinking age. Enforce the use of ignition interlock devices for repeated drink driving offenders. Setting up more road blocks for random breath testing on drivers

**The following are opioid withdrawal symptoms except:**

Sweating. Joint aches. Constipation. Restlessness. Runny nose.

**Which one of the following best describes what occupational health would encompass for a waiter/waitress working in a restaurant?**

Reduce occupational accidents such as fall risk from a shopping mall escalator as a result of unexpected malfunction

Eliminating hazardous condition at work including banning smoking during the break time of waiter/waitress

Enhancing social well-being of workers by organising an annual staff retreat

Enabling workers to conduct a socially and economically productive life by mandating a 7-day work week

**The third industrial revolution observed a rising trend of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

Child labour. Communicable diseases. Non-communicable diseases

Hazardous work environment. Work accidents and injuries

**Which one of the following contributes to a shrinking workforce in Singapore?**

Declining fertility rate. Reducing foreign manpower. Rapidly aging population. Worsening health outlook of working population

**Which one of the following diseases occurs entirely due to genetics?**

Type 2 Diabetes. Dengue. Obesity. Down Syndrome. Cancer

**Which one of the following correctly defines genomic epidemiology?**

**It involves** the use of genomic data to determine the distribution and determinants of health-related outcomes in a specified population and the application of this information to control health problems

**Individuals with \_\_\_\_\_\_\_\_\_\_\_ have a higher risk of \_\_\_\_\_\_\_\_\_\_\_\_ when taking carbamazepine for epilepsy.**

HLA-B\*1502; Stevens-Johnson Syndrome. HLA-C\*1502; Stevens-Johnson Syndrome. HLA-B\*1502; Crohn’s disease. HLA-C\*1502; Crohn’s disease

HLA-B\*1502; Down syndrome

**Which of the following(s) is/are true about the basic reproduction number, R0? You may select one or more options.**

R0 quantifies the severity of an epidemic

For a virus with R0 = 3, it results in a higher final attack size, F, than if a virus has a R0 = 2

For a virus with R0 = 0.5, there is an exponential decrease in the number of infected cases overtime

By changing the properties of a virus to limit infection, R0 can be lowered

By limiting contact between infected and non-infected people in a population, R0 can be lowered

**Prevalence refers to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Choose the most appropriate option.**

Number of current infections or number of people who ever were infected

**Below is a short conversation between two sisters, Jean and Jessie. Fill in the blank below with the most suitable option.**

**Jean: “Hey Jessie, don’t come close to me. I am still having some cough and I am still covid-19 positive!”**

**Jessie: “Chill, Jean! It’s fine, you have past the \_\_\_\_\_\_\_\_\_\_\_\_ even though you are still covid-19 positive. It’s been like 3 weeks since you are diagnosed with covid-19. I will be fine even if I am physically standing close to you!”**

Incubation period. Latent period. Symptomatic period. Infectious period

Generation time

**Which one of the following correctly describes the Black Death between year 1300-1600?**

A plague was started when the habitats of wild rodents in Central Asia was disrupted by natural disasters . It was a fatal pandemic as public health measures taken were local and unilateral

Quarantine measures were effective despite more human activities occurring across borders. New trading patterns and farming expansion worsened the recovery and rebuilding from natural disasters in Central Asia

**Which of the following(s) correctly describe(s) global health? You may select one or more option.**

It focuses on health issues of other countries, especially those of low-income and middle-income. It embraces both prevention in populations and clinical care of individuals. It seeks to achieve health equity among nations and for all people. It requires binational cooperation to address health issues which transcend national boundaries. It embraces several disciplines but do not emphasise multidisciplinarity

**In the area of social and economic environment, ­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_ is a determinant of health.**

Education level. Working condition . Availability of clean water. Availability of clean air. Genetics