1: What is public health? = Science and art of creating a healthier environment for all. (focus on population and prevention rather than on patients and treatment.)

Non-communicable disease: cannot spread, caused by unhealthy behaviours, Diabetes (537m, 1 in 10 ppl) (6.7 million deaths in 2021)

Public health issues: one health (health of ppl, ani, ecosystem are interdependent. Healthcare cost: increase due to aging population, providers increase cost, insurance increase cost.

Disease Continuum: From birth to death: 1. pre-clinical disease = disease not clinically evident. patients feel minor symptoms and signs, thus, go screening tests. 2. Clinical disease = diagnosed based on clinical findings, symptoms and signs are evident and can be observed or measured. Symptoms get serious. 3. Complications = worsen symptoms, signs and clinical test.

Screening test effectiveness:

Who should be screened: when PPV starts to increase significantly. Eg age 50 for colorectal cancer.

Does screening make a difference: 1. Extends lifespan. (Early detection of illness, thus, early intervention. Clinical disease and complication phase pushed back) 2. No difference. (No serious disease found, disease found is slow-moving e.g. prostate cancer, thus, will not be life-threatening during lifetime. 3. Shorten lifespan (With prostate cancer, unnecessary treatments like surgery and radiation induced can cause serious side effects, e.g. incontinence and sexual dysfunction.

What does public health cover?
Primary and Secondary prevention.
Primary – Prevent onset of disease, Keeping population healthy via health Protection and health promotion.
Secondary – Screening: early diagnosis
And effective interventions to delay Onset of clinical disease

What does public health NOT cover?
Tertiary prevention. – Effective treatment to delay the onset of complications and death. Rehab to improve quality of life.

BMI: Not a good indicator of health. Asians have much lower BMI compared to Whites for the same fat%. Asian fats form around organs while White fats forms below their skin, forming a belly.

Obesity trend: Males and females of age group 20-40 have significant prevalence in obesity rate. Obesity leads higher rates of diabetics.

Complications of diabetes: Damage to small and large vessels as sugar attack inner linings, causing blood clot, damage vessel, damage nerves. Can cause stroke and heart attack too.

What cause obesity: Epigenetics, Genes, Energy intake more than output, microbiome and OBESITY all connected

Paradigm shift: At first, use of knowledge to change attitude and then behaviour to promote healthier living. Now, Appeal to emotions to change the value system and attitude, thus, change behaviour.

2.Public Health Framework
1.moniter and surveillance – problem? – who, what, when, where, how – collect and analyse data to find problem
2.Identify risk and protective factors – cause? -preventable? Controllable? Priority?
3. Develop and evaluate interventions – a method, funding, a champion. Interventions can be legislative, community, individual level
4.Implementation – did solution work? Adjustments to be made? Were the results expected?

Health: affected by individual genetic factors and external factors (State of complete physical, mental and social wellbeing, not only absence of disease.)

Social determinants of health: income,housing,edu,SES,Jobsecurity, workingcondition,transport,accesstoservices,phyenviro,race,gender,stress,foodinsecurity

Social determinants of health impacts: predisposition to illness, recover from illness   Policies↓

Socio-ecological model: (IIICP) I(Age,sex,genes,ethnicity,SES,knowledge,attitudes,beliefs), I(family,peers,friends), I(home,school), C(neighbourhood),P & law↩

Institutional: access to facilities, goods and services within the institution, living/working conds, structural factors, instutional regulations/policies

community: access to facilities,goods and services within a larger social env.healthcare,comm edu,safety,sanitation,spaces,sociocultural norms,economic/political influence

Purpose of SEM: understand environmental influence on behaviour and modify influences for public health interventions

3.Health Systems = Organizations, people and actions whose primary intent is to promote, restore or maintain health.

Goals of HS (World health Report 2000) = 1. better health 2. Fairness in financial contributions(mechanism for sharing risks and financial protection e.g. insurance, free healthcare, more tax). 3. Responsiveness to people's expectations regarding non med aspects(e.g. Keeping health data confidential)

HS vs HCS: HS = service delivery, health workforce, information, medical products, financing, leadership **HCS:** service delivery, health workforce

HCS FRAMEWORK: PC = outpatient care for common health problems, mainly GPs, referrals to SS. **SC** = both inpatient and outpatient for specialised expertise, hospital-based clinics, often in emergency departments, planned elective care eg childbirth, cataract surgery, advanced medical imaging.

TC = both inpatient and outpatient for rare disorder, eg. cardiac surgeons, immunologist, pediatric hematologist, referred from PC or inpatient episode. NSC. Cancer centre

Coverage HCS: PC = 5000-50,000 (locality) (a lot of them to provide care so each has little) **SS** = 50,000-500,000 (district) **TS** = 500,000-5,000,000

Longterm Care = Assist with activities of daily living for a moderate or long period of time.

HS Structure: Ministry: MOH. Statutory board: AIC (agency for integrated care), HSA, HPB, SYNAPXE. Healthcare clusters: NHG, NUHS, Sing health

HSA: administration of justice with use of forensic science, secure blood supply for public and private hospitals, regulate health products to meet safety, quality, efficacy

Synapxe: health technology agency. To connect people and systems to power a healthier Singapore and improve health eg. health hub for patient use, electronic medical record system for clinical use (NGEMR), consolidated health records system at national-level (NEHR).

HPB: to promote healthy living via programs e.g student health centre, school dental centre, Healthier choice, national steps, school programmes, workplace prgm

RHS : Clusters (polyclinics, hospitals, national centres, academic centres) + Partners (care provides + organisation and volunteers, social agencies, grassroots)

Intermediate and long term care: community hospitals, nursing homes, hospices. daycare, comm rehab, home palliative/nursing care, meal delivery, med transport

4.HEALTH INTERVENTIONS: act for person/population whose purpose is to assess, improve, maintain, promote or modify health

Micro, Meso, Macro: micro = targeting individuals and families, changes in knowledge, attitudes, and behaviours. Meso = targeting groups and organisations like clinics, hospital, change their practise, culture and operations. Macro = targeting large-scale systems, change in laws, policies and funding

Concerns in 21st century: Aging population, frailty, chronic diseases and poor lifestyle habbits:

CURRENT HI IN SG: Micro: National steps challenge: incentivise walking and running, and other moderate-to-vigorous physical activity. Age-appropriate Health Screening in schools eg vision and vision screening and growth and development assessment. National childhood immunisation schedule in schools to immunise against measles, mumps and rubella, diphtheroa, tetanus, pertussis. Since measles and diphtheria mandatory by infectious diseases act, it is considered Macro. Project Silver screen: screening for vision,hearing and oral health for Singaporeans 60 and above. Screen for life;heavily subsidised screening for chronic disease such as colorectal cancer screening where Singapore cancer society distributes FIT kits FOC to eligible SGreans or cancers in women by bringing mammogram to peoples Age >= 50, yearly colorectal screening. Age >= 40, triyearly chronic disease screen (HBP, cholesterol, diabetes, obesity). Age >= 25, triyearly cervical cancer screen doorstep. HealthierSG. Enrolment, free first visit to discuss health and develop health plans, follow plan on app, check in doc. Advance care planning: plan and decide future healthcare treatments. Caregiver training: eg personal care techniques. reco early warning signs. **Meso:** Sliver generation ambassadors: assist health-social

needs to delay onset of frailty and disabilities. PCN: Multi-disciplinary team for effective management of chronic conditions, help patient access support services. Pooling resources, peer learning and benchmark clinical outcomes. Hospital to home: patient stratified to care needs, home visits, tele-monitoring, feedback from care team. Multiple readmissions predictive model: lower chances of readmission by providing precision care for each patient. AIC Link: help to find care-at-home, centre-based care, caregiver support. Macro: Nutri-Grade for beverages, Healthier options. CHAS: citizens to receive subsidies for medical and dental care at GP and Dental, at public specialist outpatient clinic. Hospital Subsidies: up to 80% off at public institutions. ElderShield and careshield life, premium payout starts 40 and 30 respectively and ends 65 and 67 respectively.

5. Preventing Obesity, Diabetes, Cardiovascular Diseases through Nutrition:

Obesity: cycle of childhood obesity: (healthy child no exercise/eat unhealthily) to (mildly obese child with low self esteem) to (moderately obese child subjected to bullying) to (severely obese child with health and mental issues) to (obese adult with chronic disease and poor mental health.)

Triple Burden of Malnutrition: 1. Undernutrition, thus, stunted, wasted 2. Micronutrient deficiencies 3. Overweight and obesity due to lack of healthy food

BMI: Low risk (18.5-22.9) Moderate risk (23-27.4) High risk(27.5 and above.) Higher BMI, greater risk of diabetes Higher BMI, lower insulin sensitivity . Race affects insulin sensitivity too

Diabetes: diabetic retinopathy (blindness), diabetic nephropathy (kidney disease), stroke, cardiovascular disease. Diabetic neuropathy (amputations)

Poor diet: Excess calories, saturated fats(fast food, red meat), poor quality carbohydrates(Refined CHO, sweet drinks), lack of fibre, vitamins and minerals(lack of fruits vegetables, whole grains.

Healthy Plate: half plate fruits and vegetables, ¼ wholemeal carbs, ¼ meat and others. **Healthy Options:** 5-7 serving rice and alt, 2 servings f&v,3 servings meat and alternatives, small amounts fats, oil, sugar, salt

Carbo: minimum processed whole grains, fruits, vegetables and beans = maintains blood sugar at steady state (lower GI) = promote goodhealth. Whole grains provides fibre, B vitamins, minerals and phytochemicals. Must have carbs for healthy energy intake

Protein: 3 servings a day, 1 serving from dairy or calcium rich products. Cooking method matters, no processed meat

Too much protein: 1)nutritional deficiencies(fibre) 2)bad breath,headache,constipation. 3)worsen kid for those with kid dis. 4)hearth disease, type 2 diabe, ex

Fruits and vegetables: lesser ppl eating f&v. 1) assist in food to energy 2) coenzymes and cofactors to catalyze specific reactions 3)for catabolic and anabolic path

Sweet drinks: 1) hidden source of calories, 2) liquid calories are not filling(people do not reduce food intake) 3)addictive

Inappropriate vegetarian diets lead to deficiencies in protein, omega 3 fatty acids, calcium, vit D, vit B12, Iron and zinc

Ecological model for obesity: {equilibrium fat stores = (energy intake – energy output) + physiological adjustments.} Biology and environment affect behaviour which in turn affects this equation.

Social influences on obesity: Role models: observe adults, model themselves on their parents' behaviour, lifestyle and body dissatisfaction. Peer moedelling.

Physical environment on health: accessibility and affordability to healthy food and for physical activities.

For effective interventions: muti-sectionral approach required to create environments so healthy choices easier. Most effective point to intervene is children as biological capital sets level of health at conception.

Introduce to Infectious diseases: Health and economic problem

Types of infections: Emerging (catastrophic) and Re-emerging (know about it, not spending enough time and resources on it)

Disease X: 1. Fatality: potential to cause harm 2. Infectivity: potential to spread 3.knowledge: Lack of updated scientific and PH understanding to deal with infection.

Infectious Disease Epidemiology: 1. Identify cause 2. Surveillance 3. Identify source 4. Studies of route of transmission. 5. Identify risk factors and interventions

Surveillance: Passive surveillance: ➤ continuous, systematic collection, analysis and interpretation of health related data needed for the planning, implementation & eval of PH practic ongoing reporting of a set of know diseases by health facilities in a designated region, lower cost. **Active surveillance:** ➤ Risk of overlooking unknown or excluded pathogens or conditions targeted tests, medical records review, healthcare providers interviewed to identify disease. Provides timely, accurate and complete data. But requires prior knowledge of detection methods or known symptoms, resource intensive.

Types of Surveillance: 1. Sentinel: pre-defined list of healthcare providers to provide samples or clinical data over a period of time. (Low-level outbreaks: focus on high-risk groups STD testing of sex workers) (high-prevalence outbreaks: focus on both high-risk groups and population setting eg primary care clinics) (since only from pre-selected clinics, hard to estimate true size of outbreak) 2. Seroprevalence: Antibody test to estimate the percentage of people in population who has been infected 3. Syndromic: monitor and detect potential outbreaks based on symptom pattern, early detection of outbreaks. 4. Genomic: track emergence of new variants, costly 5. Social media 6. National Notifiable Disease surveillance

Genomic Surveillance Gains: 1. Identification of source and type. 2. Improve treatment efficacy by identifying drug resistant pathogen 3. Minimise further progression to multi drug-resistance 4. Tracking of disease transmission

Social Media Surveillance: 1. high risk of sampling bias by age, language , geography, ses, gender 2. Digital search confounding

Bias in surveillance: lower income countries do not have resources to do proper surveillance, thus, lower cases reported.

Public health genomics: Contains 'instructions' to create an organism, encoded in chemicals known as "DNA"

Genomics Sizes: virus: 170,000 bp. Bacteria: 4.6 million bp Flies: 130 million bp. Humans:3.2 billion bp. Canopy plant: 150 billion bp

Genomic Epidemiology: use to genomic data to determine distribution and determinants of health-related outcomes in specified population and the application of this information to control health problems.

Genes, DNA and chromosomes: Genes determine what traits are passed down from mother to father.

Precision Medicine Goals: 1. pre empt health conditions from happening and act before too late 2. Faster diagnosis 3. Optimised treatment 4. Novel treatment (understand conditions to inform development of novel drugs

Pharmacogenomics: use of genetic and genomic information to tailor pharmaceutical treatment. E.g HLA-B 1502 gene will cause life-threatening side effects of carbamazepine(treatment for epilepsy).

Ethical, legal and social implications of genomics: what conditions should be screened for new-born babies? Public good vs personal privacy. In one study, 30 % of the HIV qceistion events were not link to the known infected partner.
Diagnostics genetic tests: Test to confirm a diagnosis based on existing symptoms, signs
Predictive genetic tests: predict a future risk of disease without symptoms or signs.
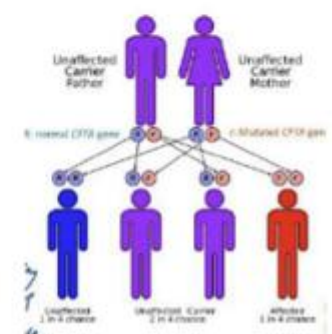
Lactoveg = !meat,fish,poultry,eggs BUT allow dairy pdts, ovoveg = !meat,fish,poulty,seafood,dairy BUT allow eggs, lacto-ovoveg = !meat,fish,poultry BUT allow dairy and eggs, pescatarian = !meat,poulty,dairy,egg BUT allow fish, pollotarian = !meat,dairy,fish BUT allow poultry, vegan = !meat,poultry,fish,eggs,dairy, flexitarian/semi-veg = primarily plant based, everyth else rare/small qty

A health system includes the resources,actors & institutions related to financing,regulation & provision of health actions(activity whose primary intent is to improve/