6.   Indicators: list and definitions

Health status indicators are a set of surveillance data that has been analysed in a way that permits assessment of the health status of the population so that public health priorities and actions can be appropriately identified. The selection of indicators should be primarily based on existing and comparable data sets for which regular monitoring is feasible, but it should also take into consideration likely future data needs and diagnostic and treatment developments. Indicators should be comprehensive, valid (sensitive), standardised, meet quality criteria, and be flexible (never fixed and final) to support evolving health policies.

Based on the suggestions of the ECHI project[1], indicators are subdivided into ***health status indicators*** (disease specific mortality, morbidity and disability), ***determinants of health*** (biological risk factors and health behaviours) and ***health systems*** (surgical procedures, medication use, use of health services).

6.1 *Health status indicators*

Disease-specific mortality, morbidity and disability should be available for the overall population and for age and sex subgroups. For each country or area it would be useful to have absolute numbers, crude and age-standardised rates according to a standard population (i.e. European standard population) [25]; standardisation in this case would improve comparability between countries with different age distribution in the population.

6.1.a   *Mortality, cause specific*

Mortality data may provide a crude but simple way to assess health conditions; the source of information are death certificates where the underlying cause of death is coded. The reliability of mortality data depends on the completeness and accuracy of the vital registration system of the country.

CVD causes of death are coded according to the International Classification of Diseases and Causes of Death (ICD). Problems of temporal and geographic comparisons derive from the different versions of the ICD adopted over time (8th, 9th, 10th revision) and from different coding practices in each country.

Definition of specific indicators:

i)   *crude death rate:* the number of overall and cause-specific deaths divided by estimated mid-year population per 1,000 [25];

ii)   *age-standardised death rate:*   death rate estimated after age-standardisation has been performed[25];

iii)   *age-specific death rate:* the number of deaths divided by estimated mid-year population per 1,000 for specific age groups[25].

6.1.b   Morbidity, diseases specific

Morbidity can be described using the following frequency measurements: hospital discharge rate, attack/incidence rate, prevalence and case fatality. In CVD, attack rates generally include first and recurrent events, while incidence rates represent only first event.

The importance of these measures differs according to the disease as well as the age range. In younger age groups the most important indicators are incidence, case fatality and prevalence; in older people, attack rate and prevalence are more important since patients with chronic diseases require more continuous therapy and rehabilitation, and have a greater impact on the public health system. For acute events, incidence rates are in general target measures, while for chronic conditions incidence as well as prevalence may be of interest. Incidence is used mostly for etiological research objectives; attack rate and prevalence are useful for hospital planning and for primary care.

Standardised rates are important to make cross-group comparisons and to investigate time trends, although absolute numbers are often necessary to evaluate the burden of the disease.

Definitions of specific indicators:

i)   *hospital discharge rate or hospitalisation rate:* the number of hospital discharge records of a specified main diagnosis divided by the estimated mid-year population per 1,000 [25];

ii)   *attack rate:* the number of events (first and recurrent) divided by the estimated mid-year population per 1,000 [25];

iii)   *incidence rate:* the number of first events divided by the population at risk per 1,000 or person/years at risk. Person/years at risk consists of the sum of periods of time (years) at risk contributed by each of the person included in the study. Incidence may be estimated through the follow-up of a population enrolled in a cohort or the identification of new events in a dynamic population. It can be obtained using longitudinal studies or disease registers, when it is possible to eliminate those who have already experienced an event [25];

iv)   *prevalence:* the proportion of persons with the disease in a population per 100 or per 1000 at a particular time. It is assessed by surveys;

v) *case fatality:* the number of fatal cases divided by the total number of events. It is usually expressed as the percentage of persons diagnosed as having a specified CVD who die from that disease within a given period [25].

6.1.c Disability

The following indicators have been used in literature to evaluate the consequences of CVD as well as the effectiveness of intervention. We propose to consider disability as a composite measure of health status according to ECHI definitions[1].

Definition of specific indicators:

i) *Disability-Adjusted Life Year (DALY):* takes into account years lost due to premature mortality and years lived with disability [26]. It is equal to the sum of the *number of years of life lost due to CVD in a population* (YLL) and the *number of years lived with disability of known severity and duration for a CVD in a population* (YLD);

ii) *Potential Years of Life Lost (PYLL):* it is a measure of the impact of premature mortality on the population. PYLL is the sum of the years that people dying from a CVD would have lived, had they experienced a normal life expectancy, usually determined at 65 years[25];

iii) *Activities of Daily Living (ADL):* the ADL index measures six basic functions (moving between rooms, using the lavatory, washing and bathing, dressing and undressing, getting in and out of bed, and feeding oneself) and has a score of A (independent in every item), B (dependent in one item), C (dependent in two items), D (dependent in three items), E (dependent in four items), F (dependent in five items) and G (dependent in all functions)[27,28];

iv) *Instrumental Activities of Daily Living (IADL):* the IADL-scale measures more complex functions (using the telephone, getting to places beyond walking distance, grocery shopping, preparing meals, doing housework or handyman work, doing laundry, taking medications, managing money). The score ranges from 8 (able to perform all functions) to 0 (cannot perform any function)[29];

v) *EuroQol (EQ):* the EQ is a standardised instrument for use as a measure of health outcome. Applicable to a wide range of health conditions and treatments, it provides a simple descriptive profile and a single index value for health status that can be used in the clinical and economic evaluation of health care as well as population health surveys[30].

6.2 *Determinants of health*

Blood pressure, tobacco smoking, total cholesterol, body mass index and physical activity are important determinants of the health status of the population. In particular, it is important to have

estimates on the prevalence of persons with hypertension, hypercholesterolemia, obesity, physical inactivity and smoking.

The main source of information on risk factors are CVD surveys conducted with internationally standardised procedures and methods; they are exhaustively described in the EHRM project.

Definition of specific indicators:

6.2.a Personal biological factors

i)   *prevalence of hypertension:* number of persons with systolic blood pressure or diastolic blood pressure equal to or greater than 140/90 mmHg or undergoing specific treatment divided by the total population. Blood pressure measurements should be obtained calculating the meaning of at least two consecutive readings [20];

ii) *proportion of hypertensives under control:* number of hypertensives undergoing specific treatment with systolic blood pressure or diastolic blood pressure equal to or lower than 140/90 mmHg divided by the total number of hypertensives [20];

iii) *prevalence of hypercholesterolemia:* number of persons with serum total cholesterol equal to or greater than 193 mg/dl or 5.0 mmol/l or undergoing specific treatment divided by the total population. Hypercholesterolemia should be determined from at least two consecutive tests [20];

iv) *prevalence of overweight:* number of persons with body mass index equal to or greater than 25 kg/m^2 and lower than 30 kg/m^2 divided by the total population [31];

v)   *prevalence of obesity:* number of persons with body mass index equal to or greater than 30 kg/m^2 divided by the total population [31].

6.2.b Health behaviours

i)   *prevalence of physical inactivity during leisure time:* available questionnaires include many integrated questions measuring time spent in sport or other activities during leisure time; however it is easier to measure the prevalence of inactive persons during leisure time [32];

ii) *prevalence of current, former and non smokers:* number of current, former and non-smokers divided by the total population; smokers are persons who smoke one or more cigarettes a day;

iii) *number of cigarettes smoked per day:* number of cigarettes smoked per day divided by the total number of current smokers.

6.3 Health system indicators

Other indicators which measure health utilisation can be used as a proxy measures for CVD: national drug consumption, surgical operations, and use of health services. These indicators are not

sufficient to evaluate morbidity, but they can be used if integrated with other sources of information.

6.3.a Medication use

Drug consumption figures should preferably be presented as numbers of *ATC-DDDs/1000 inhabitants/day* or, when in-hospital drug use is considered, as DDDs per 100 bed days. ATC is the acronym for anatomical therapeutic chemical; DDD is the acronym for defined daily dose. Prescription data presented in DDD/1000 inhabitants/day may provide a rough estimate of the proportion of the population treated daily with certain drugs; DDD is the average maintenance dose of a medication used for its main indication in adults and assumed per day.

Drugs are classified in groups at five different levels: they are divided into fourteen main groups (1st level), with one pharmacological/therapeutic subgroup (2nd level); the 3rd and 4th levels are chemical/pharmacological/therapeutic subgroups and the 5th level is the chemical substance. DDDs are assigned per ATC 5th level by the WHO Collaborating Centre for Drug Statistics Methodology in Norway [33] Drug consumption information on antihypertensives, diuretics, beta-blocking agents, calcium channel blockers, ACE-inhibitors, nitrates, anti-arrhythmics, antithrombotic agents and cholesterol and triglycerides reducers are of interest. They are used in both primary and secondary prevention. However, they are not sufficient to evaluate morbidity and need to be integrated with other data, such as surveys. Thrombolytic treatment is used only in hospital in acute myocardial infarction. Drug consumption information is not very specific in the long term, because importance of medicine use changes with time.

6.3.b Surgical operations and invasive procedures

Surgical operations and invasive procedures, in particular *coronary artery by-pass grafting* (CABG), *percutaneous transluminal coronary angioplasty* (PTCA), *heart transplantation, carotid angioplasty, pace-maker, implantable cardioverter defibrillator, catheter ablation* and *peripheral vascular operations* are indicators of health care utilisation for CHD, stroke and other CVD in the population. These indicators are expressed as number of surgical operations divided by the total population.

6.3.c In-patient care utilisation and technology

Definition of specific indicators:

i)   *cause-specific aggregate bed-days:* the number of days spent in hospital for specific disease per population;

ii) *mean and median length of stay:* mean and median number of days spent in hospital per patient;

iii) *brain imaging:* number of CT-scans or MRI per population;

iv)   *coronary angiography:* number of coronary angiographies per population;

v)   *stroke unit:* number of stroke units per population.