# Supplementary material

Table A : Derivation of our working definition of need, with reference to the framework by Culyer and Wagstaff (C&W) (1993)

| **Definitions from C&W \*** | **C&W’s description**  | **C&W’s critique** | **Our comments** | **Our working definition**  |
| --- | --- | --- | --- | --- |
| 1. Need as initial health | Need is equated with ill-health and assumes that individuals with similar health status have the same needs. | There is only need for health care if that care is available and can improve health or prevent its avoidable deterioration. Otherwise, there is a need for health (or medical research, comfort, etc.) rather than a need for health care.  | When considering need in the context of healthcare planning, it makes sense to focus on what is feasible, i.e. needs that can be met by health care. So, it is important to distinguish need for health from its derivative, need for health care. We define need as need for health care, and qualify this as health care that is effective. It excludes a health need that is unmet either because treatments do not exist, or existing treatments are ineffective. Technological progress may lead to changes in what ‘need’ means in practice (the area of the blue circle in the Venn diagram).  | We agree with the C&W framework and define ‘need’as a need for **existing, effective health care**.  |
| 2. Need as capacity to benefit | Health care is needed only if it is a necessary to attain some goal – typically, the improvement or maintenance of health.Two conditions are implied by this definition, both of which must be met for need to exist* 1. The expected marginal product (health) must be positive i.e. there is capacity to benefit from consuming health care. Preventing ill-health in future also implies the existence of ‘need’, i.e. the positive marginal product may arise later.
	2. There must be no other less costly or more productive technologies that fulfil the goal more efficiently. In other words, cost-ineffective or inefficient health care cannot be ‘needed’.
 | This definition does not address how to measure capacity to benefit. | We agree that need is capacity to benefit, but broaden the definition of ‘effective’ to include health care that does not directly improve health – the expected marginal product is zero – but that plays a subsidiary role either by reducing treatment uncertainty, or by facilitating access to effective care. This type of health care may also have benefits for mental health, by relieving anxiety associated with prognostic uncertainty (Newhouse, 1977). We agree with C&W that cost-ineffective care cannot be needed. There may be a need for care that is demonstrably cost-effective, although this depends how cost-effectiveness is defined. However, there is no evidence of the effectiveness or cost-effectiveness for many types of care (Maynard, 2012). We therefore define need as being for ‘appropriate’ care. This includes care that is cost-effective, and excludes care that is known to be cost-ineffective. It also includes care that is of unknown effectiveness or cost-effectiveness but that is provided in the right setting and at the right time. The term ‘appropriate’ involves a – usually, clinical – judgement about what ‘right’ care means and reflects the uncertainty about treatments’ effectiveness and/or cost-effectiveness.  | We agree with the C&W framework and refine our definition of need accordingly. 1. need is for health care that is effective in improving health, either now **or in the future (or both)**.
2. need is for health care that is **appropriate**.
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| 3. Need as expenditures a person ought to have | The amount of productive health care required to attain equality of health or welfare. | 1. needs are defined in relation to equality of health, but this is arbitrary;
2. the term need is defined in two senses: technical (marginal product) and normative (societal view).

C&W argue the assessment of need should be a technical exercise because a normative approach can lead to paradoxical conclusions (such as that a cost-effective treatment is not needed because society has decided this). | This is about measuring need, rather than defining it.  | No change to our working definition of need.  |
| 4. Need as expenditure required to exhaust capacity to benefit | Here C&W offer their own definition of need: expenditure required to effect the maximum possible health improvement (or to maintain a full health status), or, equivalently, the expenditure required to reduce the individual’s capacity to benefit to zero. | None | This is about measuring need, rather than defining it. | No change to our working definition of need. |

Source: Culyer and Wagstaff 1993 (C&W) (Culyer and Wagstaff, 1993). \*Definitions 1-3 are from a literature review by C&W. Definition 4 is a new definition by C&W.

Table A : Five definitions of access and their descriptions

| **Definitions** | **Description** | **Observable measures of Access** | **Correspondence to Venn diagram (Fig.1)** |
| --- | --- | --- | --- |
| Aday and Andersen (1974) | One of the first studies to acknowledge that access is determined by the interrelationship between population characteristics and the healthcare system. The authors distinguished between potential access and realised access. **Potential access** is determined by characteristics of health delivery system and characteristics of population at risk. **Realised access** is determined by utilization of the health services and consumer satisfaction. | Potential access * Service availability
* Population characteristics

Realised access* measures of utilization
* consumer satisfaction.
 | Potential Access in areas:1, 2, 7Realised Access in areas: 4, 5 and 6 |
| Penchansky and Thomas (1981) | Access defined as the degree of fit between the patients and the healthcare system. Access is summarised across five distinct dimensions: 1. Availability: relationship between volume and type of services and need.
2. Accessibility: relationship between location of supply and location of service users. Includes travel time and cost.
3. Accommodation: relationship between how services are organised and service users’ ability to ‘accommodate’ them.
4. Affordability: relationship between prices and ability to pay.
5. Acceptability: relationship between service user attitudes to provider characteristics and vice versa.
 | Penchansky and Thomas use patient satisfaction data to derive measures for each of the five dimensions.  | Access in areas: 4, 5 and 6 |
| Goddard and Smith (2001) | Access as a supply side issue (equal services made available for those in equal need). The authors define access as the ability to secure a specified range of services, at a specified level of quality, subject to a maximum level of opportunity cost, whilst in possession of a specified level of information. Hence, variations in (supply side) access might arise from variations in: 1. availability of services/treatments
2. quality of services
3. cost (financial / non-financial) of services
4. information availability
 | The authors note that access as defined here cannot be observed directly. Some individual elements can be measured (e.g. resource availability, waiting times, user charges, barriers to care), but often only utilisation is observed. | Access in areas: 4, 5, 6 and 7 |
| Gulliford et al. (2002) | The authors focus on the British NHS, arguing that access is a complex concept that should be measured on at least four dimensions and that none of these dimensions is sufficient in its own right. The four dimensions are: 1. Service availability: this is about the opportunity (potential) to obtain health care – whether individuals ‘have access’, and is determined by the adequacy of supply.
2. Utilisation of services and barriers to access (personal, financial and organisational): this is about whether individuals ‘gain access’. Covers affordability, accessibility and acceptability.
3. Relevance and effectiveness: utilisation of appropriate services determines the health outcomes resulting from gaining access. This is relevant access.
4. Equity: vertical and horizontal equity can be measured in terms of availability (#1), utilisation (#2), or outcomes (#3).
 | Ways to measure the dimensions: 1. Service availability: GP per capita, %pop registered with dentist, %pop accessing specialist surgical services); from a health economics perspective service availability may be measured in terms of the costs to individuals of obtaining care (travel, time, benefits foregone).
2. Barriers to access. Financial: services charges, co-payment and other costs such as time, travel and earning Lost; Organisational: waiting times and ii. Variation /mode of referral from primary to secondary care.
3. Relevance and effectiveness: appropriate indicators of health status.
 | **Service availability:** Access in areas: 1, 2, 4, 5, 6, 7**Utilisation**: Access in areas: 4, 5, and 6**Relevance and effectiveness**: Access in areas: 4 and 5 |
| Levesque et al. (2013): | Access as the opportunity to reach and obtain appropriate healthcare services in situations of perceived need for care. Access is a dynamic process that results from the interface between supply side features of health systems and organisations and demand-side features of populations. In this framework, five corresponding abilities of populations interact with the dimensions of accessibility to generate access. The authors conceptualise five dimensions of accessibility (supply-side factors): 1. Approachability
2. Acceptability
3. Availability and accommodation
4. Affordability
5. Appropriateness.

Five corollary dimensions of abilities (demand side-factors): 1. Ability to perceive
2. Ability to seek
3. Ability to reach
4. Ability to pay
5. Ability to engage.
 | Supply side:1. Approachability: Transparency, Outreach, Information, Screening
2. Acceptability: Professional values, norms, culture, gender
3. Availability and accommodation: Geographic location, Accommodation, Hours of opening, Appointments mechanisms
4. Affordability: Direct costs, Indirect costs, Opportunity costs
5. Appropriateness: Technical and interpersonal quality, Adequacy, Coordination and continuity

Demand side:1. Ability to perceive: Health literacy, Health beliefs, Trust and expectations
2. Ability to seek: Personal and social values, culture, gender, autonomy
3. Ability to reach: Living environments, Transport, Mobility, Social support
4. Ability to pay: Income, Assets, Social capital, Health insurance
5. Ability to engage: Empowerment, Information, Adherence, Caregiver support
 | Access in areas: 4 and 5. |