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Changes in Disease Patterns and Their Measures: A Case Study in Dental Health

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Measuring success in health is complex. We look for one-line answers, but reality is not so simple. We are accustomed to using population-level yardsticks such as total coverage, average patient attendance, and analogous single number outcomes. In dentistry, we regularly see similar single parameters of effectiveness such as average levels of decay; but are they the right measures for today? Historically, much of society suffered from conditions such as dental decay. Today's disease patterns have shifted, affecting smaller sub-groups within society; therefore, our former global measures may now be misleading. For example, the first people of Australia, the Aboriginal and Torres Strait Islander people, suffer decay rates resulting in hospitalisation at rates 2-5 times higher than the rest of the population.[1]

This is particularly true of chronic dental conditions such as dental decay and periodontal disease, and is further intensified by both increased longevity and dietary sugar consumption. As many people in developed countries having had the advantage of good preventive health and therapeutic care, we are observing a shift away from universal disease burdens to a substantial level of burden now resting among those in poverty.[2]

If we want our health systems to adapt to the changing disease landscape, we have to evolve the measures of system success, as these are the drivers of change. Previous measures, which are no longer applicable to current distributions of disease, are not going to drive reform.

Dentistry is a microcosm of this change and the growing disjunction between disease patterns and health system measurement that is affecting our policy evidence base. For example, dental decay in Australia affects less than 1 in 2 children (30-40%) and only 5% of children have more than 4 decayed teeth. Meanwhile, the rates of edentulous (i.e., false teeth) in the elderly have fallen from nearly universal to under 1 in 5. National dental health reports continue to present data as if the whole population is affected. We continue to see State and Federal governments quote population means (and at best standard deviations) when anywhere between 50 to 70% of the population have no disease (in the case of

[1] Tennant M, Namjoshi D, Silva D and Codde J. Oral health and hospitalization in Western Australian children. *ADJ.* 2000;45: 204-207.

[2] Anjrini AA, Kruger E, and Tennant M. A 10-year retrospective analysis of hospitalisation for oral cellulitis in Australia: the poor suffer at 30 times the rate of the wealthy. *FDJ.* 2014;5: 8-13.

childhood decay). By refining our measures to focus on the sub-groups of the population that have disease, we can focus resources where issues persist. For example, indices have been developed to measure the level of dental decay in the 10, 20 or 25% of the population with the highest levels of decay.[3]

College level mathematics tell us that measuring total population data when disease is now limited to an ever diminishing minority is not statistically appropriate – it masks reality and the real disease distribution, and more importantly it drives systems towards goals that are neither effective nor efficient in the modern disease landscape.

We now know that dental disease is closely linked to socio-economic status and marginalized communities. For the wealthy and urban, health results from relatively "easy" access to services and available and effective prevention services.[4]

Moving away from this "core of health privilege" rapidly reveals a greater incidence of disease, including dental disease, and increasing difficulty in accessing services. For example, in dentistry we promote water fluoridation, which most large cities have access to but smaller remote towns do not.[5] The consequence is an extension of what is commonly referred to as the inverse care law: where there is more disease there is less care. The law, formulated by Jullian Hart in 1971, states, "*The availability of good medical care tends to vary inversely with the need for it in the population served."*[6] By aggregating a substantial number of people with low disease burdens and high accessibility to services, population level averaging masks the unequal distribution of disease and suffering. This type of measure can drive inefficiency.

To address the issues noted it the inverse care law, new systems of measures, and thus drivers, are required to identify where disease exists and who is suffering. Experts and policy leaders need to start with a call to change the measures with which we asses our systems, to re-orient our leadership to modern disease distributions. Statistically relevant measures are available, and the must be used and demanded by policymakers as system measures. If we truly want to address marginalization and health inequality, we have to measure success with metrics that are tuned to identify these issues. To do this, we have to build metrics specific for the task. For example, in dentistry our measures of effectiveness could be limited to addressing decay in the 10 to 20 poorest or most remote suburbs. If we did this, we would rapidly see resources redirected to effect improvement. As a community, we have a moral obligation not to be as interested in the dental health of the wealthy, easy-to-reach suburbs when we know dental decay is tightly linked with poverty and substantial private sector

[3] Bratthall D. Introducing the significant caries index together with a proposal for a new global oral health goal for 12-year olds. *Int Dent J.* 2000. 50: 378-384.
[4] Tennant M, Kruger E, and Shiyha J. Dentist-to-population and practice-to-population ratios: in a shortage environment with gross mal-distribution what should rural and remote communities focus their attention on? *RRH.* 2013;13: 2518.
[5] Tennant M, Kruger E, and Shiyha J. Dentist-to-population and practice-to-population ratios: in a shortage environment with gross mal-distribution what should rural and remote communities focus their attention on? *RRH.* 2013;13: 2518.
[6] Hart TJ. The inverse care law. *The Lancet.* 1971:297: 405–412

services are already available in the "health rich" parts of our cities.[7]

Communities need to work on breaking the inverse care law by using appropriate measures. In order to improve outcomes under circumstances of limited resources, as often occurs in government systems, we must make every effort to target the right population. In this way, we can re-direct system leaders and most efficiently use scarce resources to improve the health of those most in need.

Clearly, we are not alone as a discipline, and the principles of targeting services according to disease status and the redirection of resource allocation through appropriate outcome measurements is not new or unique, but are be a key to breaking the inverse care law. Dental Public Health experts and government agencies should be strongly advocating for moving towards more specifically targeted measures to advance the health of those in need.

History has done us well, our systems and measures have helped us live twice as long as our ancestors, but even our ancestors would have said what was done in the past should be learned from and adapted. It is time to move forward by reforming our measures of system performance to include targeted outcomes for people and places where disease burdens remain high.

[7] Tennant M and Kruger E. A national audit of Australian dental practice distribution: do all Australians get a fair deal? *IDJ*. 2013;63: 177-82