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Review

The 5As: A practical taxonomy for the determinants of vaccine uptake

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ABSTRACT

Suboptimal vaccine uptake in both childhood and adult immunisation programs limits their full potential impact on global health. A recent progress review of the Global Vaccine Action Plan stated that "*countries should urgently identify barriers and bottlenecks and implement targeted approaches to increase and sustain coverage*". However, vaccination coverage may be determined by a complex mix of demographic, structural, social and behavioral factors. To develop a practical taxonomy to organise the myriad possible root causes of a gap in vaccination coverage rates, we performed a narrative review of the literature and tested whether all non-socio-demographic determinants of coverage could be organised into 4 dimensions: *Access*, *Affordability*, *Awareness* and *Acceptance*. Forty-three studies were reviewed, from which we identified 23 primary determinants of vaccination uptake. We identified a fifth domain, *Activation*, which captured interventions such as SMS reminders which effectively nudge people towards getting vaccinated. The 5As taxonomy captured all identified determinants of vaccine uptake. This intuitive taxonomy has already facilitated mutual understanding of the primary determinants of suboptimal coverage within inter-sectorial working groups, a first step towards them developing targeted and effective solutions.

1. Introduction

A recent progress review of the Global Vaccine Action Plan (GVAP) stated that "*countries should urgently identify barriers and bottlenecks and implement targeted approaches to increase and sustain coverage*" in immunisation programs [1]. The EU council recently highlighted the failure of member states to reach influenza vaccine coverage targets, leaving approximately 60 million elderly and at-risk patients unvaccinated every year [2,3]. To achieve the goals of vaccination policies, programmatic and supply challenges must be addressed, but there is also increasing awareness that vaccine hesitancy, recently defined a delay in acceptance or refusal of vaccines despite availability of vaccination services [4], may be an important cause of suboptimal vaccine uptake (defined as the use of a vaccine in an immunisation program). Vaccine hesitancy may be due to a complex mix of behavioral and social factors, and most interventions to increase vaccine acceptance have shown little or no effect [5]. Furthermore, where hesitancy has been assumed to be the root cause of poor vaccine uptake, closer study may reveal the greater importance of other reasons related to, for example, delivery of vaccination [6].

To effectively address a gap in coverage in a vaccination program, we must therefore begin by identifying and weighting the primary determinants of vaccine uptake. The root causes of suboptimal uptake are complex and context-dependent, and even the equation "*vaccination uptake = access + acceptance*" [7] seems too simplistic to offer a viable explanation. A number of reviews have identified, and several have recently attempted to classify, the myriad possible determinants of vaccine hesitancy, and more broadly vaccine uptake [8–15]. However, these classifications of possible causal factors are often conceptual, focused on a single vaccine, or difficult to translate into practice.

There is a need for a pragmatic methodology to facilitate the diagnosis of the possible root causes of a vaccination coverage gap and support the subsequent design of a robust, evidence-based, interventions. To this end, we aimed to develop a practical taxonomy for the myriad possible root causes of a vaccination gap. Building upon a previous proposal of access plus acceptance[16], we hypothesised four vaccination-related dimensions which could influence vaccination uptake: Access, Affordability, Awareness, and Acceptance. A fifth dimension, Activation, was uncovered during the review of the literature. Table 1 provide a working definition for each of these five dimensions.

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Table 1
Working definitions and contributing factors of the 5As.

Root cause	Definition
Access	The ability of individuals to be reached by, or to reach, recommended vaccines
Affordability	The ability of individuals to afford vaccination, both in terms of financial and non-financial costs (e.g., time)
Awareness	The degree to which individuals have knowledge of the need for, and availability of, recommended vaccines and their objective benefits and risks
Acceptance	The degree to which individuals accept, question or refuse vaccination
Activation	The degree to which individuals are nudged towards vaccination uptake

In this narrative review, we used these dimensions to organise the literature to assess whether this was a reliable, comprehensive and operational taxonomy for the non socio-demographic determinants of vaccine uptake.

2. Method

2.1. Search strategies

A search was conducted via Social Sciences Citation Index (SSCI)—1970-present, using the string (vacci* OR immuni*) AND uptake, with the time span between 1st January 2003 to 29th January 2013.

2.2. Inclusion and exclusion criteria

A total of 485 records were exported in full into Excel. Abstracts were first reviewed to identify eligible abstracts against the inclusion and exclusion criteria (see Fig. 1). Literature was included if the targeted vaccinations sourced from World Health Organisation (WHO) prequalified vaccinations [17] were mentioned in either the abstract or title, this included the vaccination full name and the appropriate abbreviations (measles, mumps, rubella, MMR).

Human Papillomavirus (HPV) vaccine was excluded due to a recent review of factors associated with its uptake [18]. Equally, only the targeted countries were included: Estonia, Latvia, Lithuania, Brazil, Venezuela, Columbia, Peru, Bolivia, Argentina, Chile, Nigeria, Russia, India, Australia, United States (USA) and UK (England, Scotland and Wales).

Exclusion of literature included: Reviews, Editorial Material, Article proceedings paper and articles that did not mention the targeted vaccinations or countries. Furthermore, articles were also excluded if in relation to other drugs, livestock/animal, food services, cost effectiveness, cost utility, feasibility, prenatal services/health services not inclusive of specific vaccination information, disease control systems, infection rates, effect on cancer rates, effects on uptake of cancer/hearing screening. Finally, articles were excluded when there was insufficient or no information provided in the title or abstract indicative of evidence pertaining to the identification of a barrier to, or driver for, vaccine uptake.

2.3. Data extraction and final selection

The initial selection identified 65 articles. Full text papers were obtained for each of these articles. A follow-up assessment of the articles identified a further 27 articles that did not meet the exclusion inclusion criteria, analysed data which preceded 2003, only referred to socio-demographic determinants of vaccine uptake or did not provide evidential statements in relation to barriers or drivers of vaccine uptake where evidence included direct facts or information to support the validity of the barrier or driver identified (see Fig. 1).

2.4. Content analysis method

KR first reviewed each selected article and recorded statements providing evidence of a determinant of vaccine uptake in database (e.g., "A significantly higher proportion of infants born in hospitals were vaccinated in the first six weeks compared to those born outside hospitals" [19]). She then categorised each piece of evidence as pertaining to access, affordability, awareness, acceptance, or other, using the definitions of each dimension (see Table 1). This initial categorisation was reviewed and discussed with GVT and disagreements were discussed and resolved through consensus. Subsequently, KR coded the subcategories of evidence classified under each dimension of the 4As. For example, the piece of evidence mentioned above was classified as evidence pertaining to the location of uptake within the access dimension. Subcategories were again reviewed and discussed with GVT and disagreements were resolved through consensus. Finally, the 'other' dimension was further content analysed and the factors identified were classified into those that could be modified through an intervention (subsequently labelled "activation factors") and those that could not (e.g., sociodemographic predictors of uptake, subsequently excluded from the analysis).

3. Results

3.1. Study characteristics

Of the 38 studies included in the final sample, 15 studies focused on Influenza (39%), 12 on MMR (32%), 2 on DTP/DTP3, 1 on

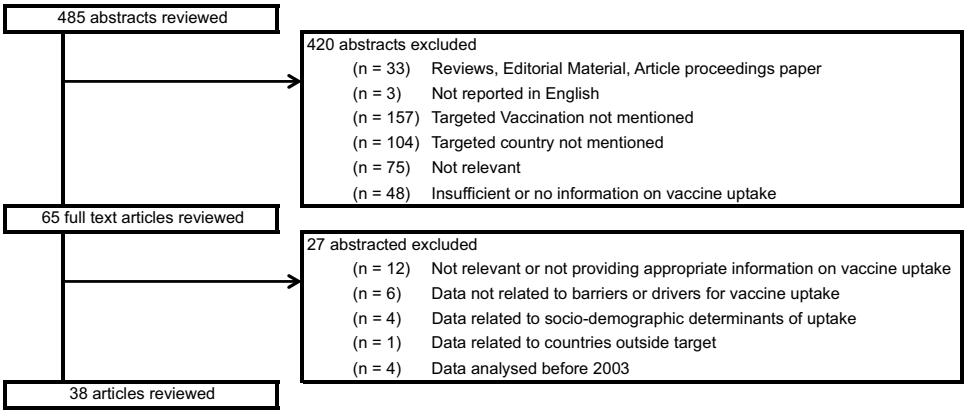

Fig. 1. Flow chart of selection process for inclusion of articles in review.