

Fig. 1. Annual trends of numbers of agenda items in Committees A and B, 1970–2012.

Technical and Health Matters comprised 423 Health Matters and 182 Progress Reports.

3.2. Annual trends of numbers of agenda items in Committees A & B (1970–2012)

Fig. 1 shows the annual trends of numbers of agenda items in Committees A & B from 1970 to 2012, consisting of Administrative Matters, Health Matters, and Progress Reports. The average number of WHA agenda items per year was 38; the lowest number was 22 in 1984 and the highest was 67 in 2012. The trend of annual numbers of agenda items shows a gradual parabola whose lowest point was around 1984–1985. In most years until 1991, the number of Administrative Matters exceeded the number of Technical and Health Matters. However, after 1992, the proportion of Technical and Health Matters increased substantially.

3.3. Number of health matters by categories and sub-categories

As shown in Table 1, the numbers of Health Matters by categories and sub-categories are described as follows: 423 Health Matters were categorized into the categories: *communicable diseases* (107, 25.3%), *noncommunicable diseases* (59, 13.9%), *health through the life course* (36, 8.5%), *health systems* (81, 19.1%), *preparedness, surveillance and response* (58, 13.7%) and *others* (82, 19.4%).

In terms of characteristics of each category by decade from the 1970s to the 2010s, *communicable diseases*, *noncommunicable diseases* and *preparedness, surveillance and response* were mainly discussed in the 1970s, the 2000s and the 2010s. *Health systems* and *health through the life course* were continuously debated from the 1970s to the 2010s.

There were 11 sub-categories which were discussed over 10 times in the WHA between 1970 and 2012: strengthening health systems (32 times), neglected tropical diseases (23 times), smallpox (20 times), health for all by 2000 (18 times), HIV/AIDS (14 times), infant

and young child nutrition (12 times), international health regulations (IHR) (12 times), polio (10 times), influenza (10 times), noncommunicable diseases in general (10 times) and tobacco (10 times). Among the sub-categories, noncommunicable diseases in general started being discussed eight out of 10 times after 2007.

3.4. Relationship between WHA agenda items and health issue milestones

To examine the relationship between WHA agenda items and health issue milestones, we analysed the number of agenda items and selected major health issues outside WHO (Fig. 2). Only the sub-categories of agenda items directly related to the health issue milestones were highlighted in Fig. 2. The other sub-categories shown in Table 1 were summarized as "others" in this figure. For the category of *communicable diseases*, the agenda item of smallpox was mainly discussed in the 1970s in order to eradicate the disease. This topic was then discussed after 1996 for destruction of variola virus stocks. The agenda of HIV/AIDS was started to be discussed from 1986 and frequently discussed after 2000. It corresponded with the period of accelerated response to HIV/AIDS such as UN Security Council discussed the effect of AIDS on peace and security in 2000 and the founding of the Global Fund to fight AIDS, Tuberculosis and Malaria in 2002. For the category of *noncommunicable diseases*, the sub-category of noncommunicable diseases in general was discussed in 1998 and 2000 and frequently discussed after 2007. These discussions led to the United Nations General Assembly holding a High Level Meeting on the Prevention and Control of Noncommunicable Diseases. In the category of *health through the life course*, the agenda titled maternal and child health (MCH) including newborn health was discussed only three times in 1979, 1992 and 2007, even though there had been some important milestones such as the Safe motherhood initiative in 1987, International Conference on Population and Development (ICPD)

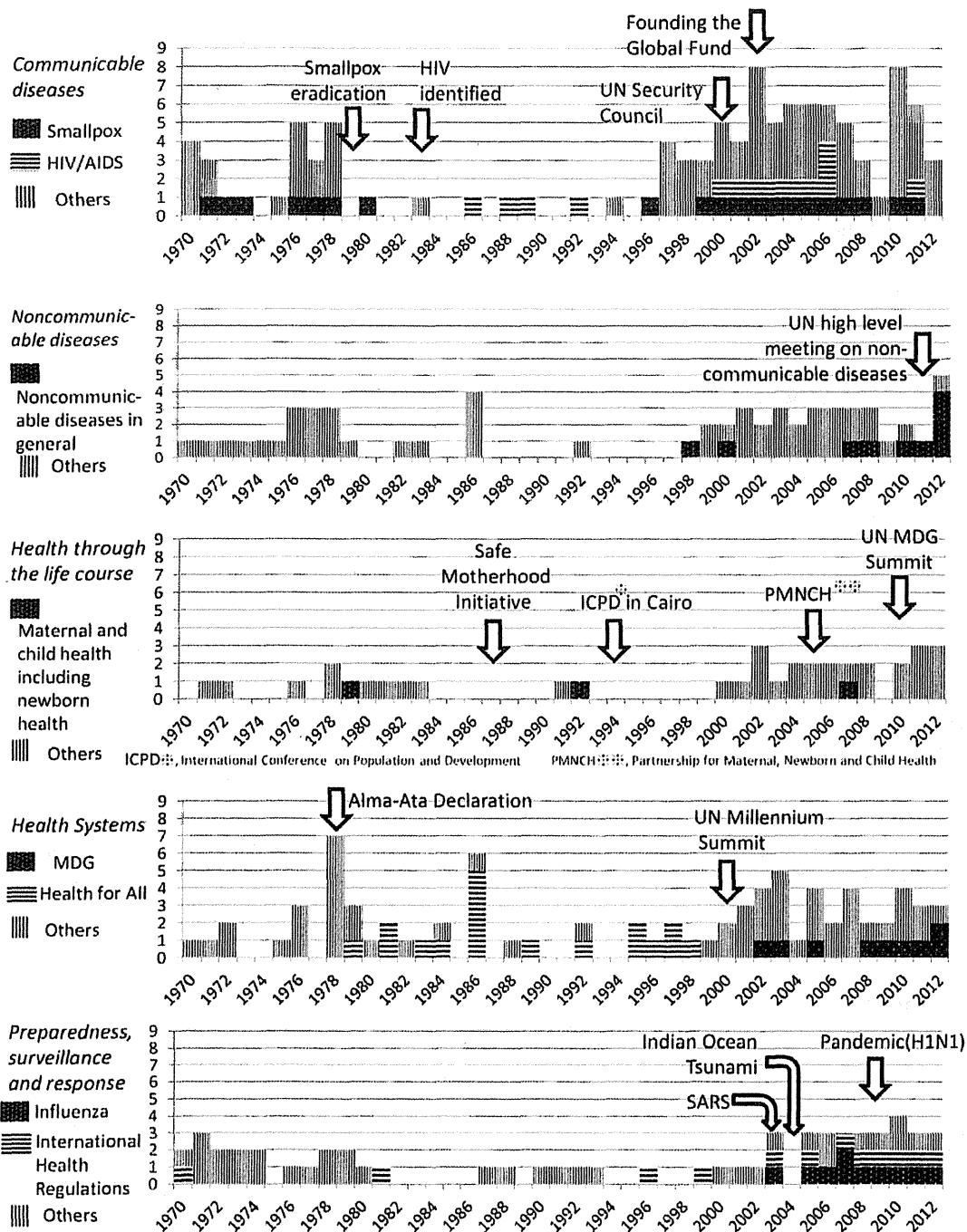


Fig. 2. The relationship between the health issue milestones and the trend of related sub-categories of the WHA agenda items.

in 1994, the Partnership for Maternal, Newborn and Child Health in 2005 (PMNCH) and UN MDG summit in 2000. For the category of *Health systems*, after the Alma-Ata Declaration in 1978, agenda items relating to health for all were discussed 18 times between 1979 and 1998. After 2000, the agenda items related to strengthening health systems and MDGs were discussed 19 and 9 times, respectively. The result indicated a shift in the major health

issues from health for all based on PHC to strengthening health systems and MDGs after the UN Millennium Summit in 2000. After 2003, for the category of *preparedness, surveillance and response*, influenza and IHR were discussed 10 times and 8 times, respectively. It corresponded to Severe Acute Respiratory Syndrome (SARS) in 2003, the tsunami in the Indian Ocean in 2004, and Pandemic (H1N1) 2009.

Table 2
Number of Health Matters and progress reports in each Director-General's terms of office between 1973 and 2012.

Names of Director-General	Term of office	Years of WHA ^a	No. of WHA	Total no. of Health Matters	Total no. of progress reports	Average no. of Health Matters per WHA	Average no. of progress reports per WHA
Mahler	1973–1988	1974–1988	15	106	22	7.1	1.5
1st term			5	61	5	12.2	1
2nd term			5	25	9	5	1.8
3rd term			5	20	8	4	1.6
Nakajima	1988–1998	1989–1998	10	34	73	3.4	7.3
1st term			5	16	21	3.2	4.2
2nd term			5	18	52	3.6	10.4
Brundtland	1998–2003	1999–2003	5	76	0	15.2	0
Lee	2003–2006	2004–2006	3	58	21	19.3	7
Chan	2006–	2007–2012	6	104	66	17.3	11
Total			39	378	182	9.7	4.7

^a The WHA of the year of appointment of each Director-General was excluded.

3.5. Number of health matters & progress reports by Director-Generals' terms of office

Since the agendas for the WHA proposed by the Director-General are discussed by the Executive Boards, we examined the average numbers of Health Matters and Progress Reports by the term of office of Director-Generals (Table 2).

The average numbers of Health Matters per WHA were less than 10 during Mahler and Nakajima's terms of office, but they were over 15 during Brundtland, Lee and Chan's terms of office. The average numbers of Progress Reports per WHA were 1.5 and 0 in Mahler and Brundtland's terms of office, respectively. On the other hand, they were 7.3, 7, and 11 in Nakajima, Lee, and Chan's terms of office, respectively. These results indicated that there were different patterns of average numbers of Health Matters and Progress Reports in each Director-General's term of office.

4. Discussion

In this article, we reviewed and analysed the agenda items of the WHA from 1970 to 2012. We identified a number of trends and characteristics of international health which have been determined by the agenda items on health issues of the WHA. First, the number of Health Matters was low from the 1980s to the mid-1990s and that of Health Matters and Progress Reports varied for each Director-General's term of office. Second, among the five categories of the WHO reform, *communicable diseases* was the most discussed at 25.3%, followed by *health systems* at 19.1%, but *health through the life course* accounted for 8.5%, which was relatively small compared with the other categories. Third, among the sub-categories, HIV/AIDS, noncommunicable diseases in general, health for all, MDGs, influenza, and IHR discussed over nine times and appeared associated with the public health milestones, but MCH including newborn health was discussed only three times. Fourth, the sub-category of noncommunicable diseases in general increases after 2007.

A characteristic from the 1980s to the mid-1990s was the low numbers of Health Matters. This was during Mahler's second terms of office and Nakajima's first term of office. The period of low numbers of Health

Matters corresponded with the period of a high number of agenda items for health for all in Fig. 2. Even when there were no Health Matters in the WHA in 1985, WHO documentation mentioned that Technical Discussions entitled Collaboration with Non-Governmental Organizations in Implementing the Global Strategy for health for all seemed to have taken place separately from the Agenda in the WHA (WHA38/1985/REC/2). Having many debates between selective and comprehensive PHC as well as considerable obstacles to progress towards health for all [20–22], the WHA in 1995 stressed the continued validity of health for all as a timeless aspirational goal and agreed that a new global health policy should be elaborated [23]. Thus, the Alma-Ata Declaration provided the revolutionary principles of health throughout the world in 1978 [24], and WHA adopted the *Global Strategy for Health for All by the year 2000* in 1981 [25], which seemed to affect the number of WHA agenda items from the 1980s to mid-1990s. In short, the period from 1980 to the early 1990s can be summarized as a period of concentration on PHC.

A characteristic from the late 1990s to the early 2000s was the increasing number of Health Matters. This corresponded to Nakajima's second term of office and Brundtland's term of office. WHO published the World Health Report targeted on infectious diseases in 1996 [26] and the number of agenda items for *Communicable diseases* started to increase from that year, as shown in Table 1. After 2000, strengthening health systems and MDGs were frequently discussed in the WHA, as shown in Table 1 and Fig. 2. These results indicate that the period between the late 1990s to the early 2000s was a turning point in terms of *Communicable diseases* and *Health systems*.

Both the total number and type of agenda have been expanding remarkably since the late 1990s. Since the first function of the WHA is to determine the policies of the WHO, it is critically important for the WHO and Member States to properly prioritize and effectively discuss the agenda items in the limited time given to the Assembly so that the WHO might be able to revitalize its ability in setting its own priorities although the 75% of its budget comes from voluntary contribution [27]; funds that donor countries often earmark for their own pet projects.

Health Matters in the WHA may not have covered all the major important health issues in the world. It is notable that the number of agenda items in the category of 'Health through the life course' accounted for only 36 (8.5%) of the total of 423 Health Matters between 1970 and 2012. In this sub-category, the WHO has mainly focused on the breast milk issue, which led to the International Code on Marketing of Breast Milk Substitute (hereafter referred to as the Code) adopted in 1981. The objective of the Code was to restrict advertising of formula milk aiming to eliminate the negative impact on babies of formula milk, especially in the developing world. Within three years of its adoption, 130 countries had taken action by passing legislation or formulating policies to restrict advertising [28]. However, the formula milk industry continued to undermine the Code [29–31]. As Forsyth pointed out, it was not uncommon that a formula-milk company located in one country may violate the Code regulations in another country [32]. This must be a challenge for future WHA resolutions. Although MCH including newborn health is tremendously important [33,34], there were only three Health Matters related to MCH, including newborn health, in 1979, 1992 and 2007. It seems to be imbalanced agenda setting compared with the burdens of mortality and illness of infectious diseases and noncommunicable diseases [35–37].

To assess the possible imbalanced agenda setting, we apply the disability-adjusted life year (DALY) to the WHA agenda items, where appropriate, since DALY is a known metric to qualify the burden of disease, injuries and risk factors [38,39]. HIV/AIDS (DALY 3.8), tuberculosis (DALY 2.2), and malaria (DALY 2.2) are discussed 14 times, 7 times, and 9 times, respectively, in the WHA, which seems to be associated with DALY. On the other hand, maternal conditions (DALY 2.6), perinatal conditions (DALY 8.3), neuropsychiatric disorders (DALY 13.1), and road safety (DALY 2.7) have high burdens of disease and injuries, but were not frequently discussed at the WHA. Meanwhile, there are many agenda items which do not have DALY. The WHA also should not overlook other important health issues such as potable water, climate change, healthy ageing, occupational health, which are not frequently discussed, while appropriate measures are not available to assess the burdens of their risks.

On the other hand, the WHA brought important health issues to the global health arena such as noncommunicable diseases and the IHR. After the year 2007, the number of "noncommunicable diseases in general" as sub-category has increased mainly due to the agenda item named "Prevention and control of noncommunicable diseases". This ties up with the recent attentions on the diseases and leads to the United Nations High Level Meeting on the Prevention and Control of Noncommunicable Diseases [40]. It indicates that the WHA discussed the important agenda item which has great disease burden before any other major health organization may decide to do so. Regarding the IHR, WHA had frequently discussed and revised it as IHR (2005), which could respond timely the pandemic (H1N1) 2009 and health risks and emergencies [41,42].

The agenda items of WHA are mostly decided by the Executive Board in January, held four months before the

WHA. In the process of agenda setting, not only does the Director-General draw up a draft of the provisional agenda, but Member States or Associate Members of the WHO are also allowed to propose a provisional agenda item [1]. In this sense, the agenda setting of the WHA is not confined. Therefore, Member States and Associate Members of the WHO are responsible for agenda setting to facilitate the attainment by all peoples the highest possible level of health.

This article has several limitations. First, we considered the quantity rather than the quality of the WHA agenda items. Recognizing that the numbers of the agenda items do not directly reflect the weight of health issues, we selected a simple and clear way to compare the number of the agenda items in this analysis. Second, we did not focus on the resolutions, but on the agenda items of the WHA. Since a resolution was not always adopted from each agenda item, we decided to use the agenda items to analyse the trends and characteristics of international health issues. Third, we did not analyse WHO budgetary allocations relating to the WHA agenda items in this study. Stuckler et al. [43] noted that WHO biennial budget allocations from 1994–1995 to 2008–2009 were heavily skewed towards infectious diseases. Our data indicated that the WHA agenda items for the *Communicable diseases* from 1994 to 2009 accounted for 61 out of 196 Health Matters (31.1%). Further studies about the resolutions and budgetary allocations would be our future challenge. Finally, we utilized the five categories from the WHO reform in the 65th WHA. Since the new categories are created for the WHO's priority setting and programmes, each category in our study includes a limited number of health issues based on that priority [11]. Thus, 82 agenda items were classified into *others* in our analysis. However, we believe that our analysis will help to consider the WHO reform and which agenda items should be discussed in the future WHA.

5. Conclusions

In this article, we found a number of trends and characteristics of international health issues among agenda items through the WHA for 43 years. Among the five categories of the WHO reform, *communicable diseases* was the most discussed, followed by *health systems*, but *health through the life course* was relatively small compared with the other categories. Among the sub-categories, HIV/AIDS, noncommunicable diseases in general, health for all, MDGs, influenza, and IHR discussed frequently and appeared associated with the public health milestones. The fact that the number of noncommunicable diseases in general as sub-category increased after 2007 deserves attention. However, the agenda items of the WHA do not always reflect international health issues in terms of burdens of mortality and illness, such as MCH including newborn health. Most of the WHA agenda items are decided by the Executive Board meeting every January. Therefore, reflecting from the number and the trend of the WHA agenda items, Member States and Associate Members of WHO should take more respective and responsive roles in setting agenda items to attain the highest possible level of health for all.

Conflict of interest statement

None declared.

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References

- [1] World Health Organization. *Basic documents: forty-sixth edition*. Geneva: World Health Organization; 2009. Available on line at: <http://apps.who.int/gb/bd/>
- [2] World Health Organization. *Governance; 2012*. Available on line at: <http://www.who.int/governance/en/>
- [3] World Health Organization. *Sixth-fourth World Health Assembly A64/1 Rev.1; 2011*. Available on line at: http://apps.who.int/gb/ebwha/pdf_files/WHA64/A64.1Rev1-en.pdf
- [4] World Health Organization. *WHO regional offices; 2012*. Available on line at: <http://www.who.int/about/regions/en/index.html>
- [5] World Health Organization. *Global health histories. Illustrated landmarks in the history of WHO; 2012*. Available on line at: <http://www.who.int/global.health.histories/links/en/>
- [6] Brown TM, Cueto M, Fee E. The World Health Organization and the transition from "international" to "global" public health. *American Journal of Public Health* 2006;96:62–72.
- [7] Bynum WF, Porter R. The World Health Organization and its work, 1993. *American Journal of Public Health* 2008;98:1594–7.
- [8] Godlee F. WHO in retreat: is it losing its influence? *BMJ* 1994;309:1491–5.
- [9] Moon S, Slezak NA, Michaud CM, et al. The global health system: lessons for a stronger institutional framework. *PLoS Medicine* 2010;7:e1000193.
- [10] World Health Organization. *Documentation; 2011*. Available on line at: <http://apps.who.int/gb/>
- [11] World Health Organization. *Sixty-Fifth World Health Assembly Provisional agenda item 12. WHO reform. A65/5 Add.1; 2012*. Available on line at: http://apps.who.int/gb/ebwha/pdf_files/WHA65/A65.5Add1-en.pdf (26.04.12).
- [12] World Health Organization. *Handbook of resolutions and decisions of the World Health Assembly and Executive Board Volume I (1948–1972)*. Geneva: World Health Organization; 1973.
- [13] World Health Organization. *Handbook of resolutions and decisions of the World Health Assembly and Executive Board, Volume II (1973–1984)*. Geneva: World Health Organization; 1985.
- [14] World Health Organization. *Handbook of resolutions and decisions of the World Health Assembly and Executive Board, Volume III (1985–1992)*. Geneva: World Health Organization; 1993.
- [15] World Health Organization. *Everybody's business: strengthening health systems to improve health outcomes, WHO's framework of action*. Geneva: World Health Organization; 2007. Available on line at: <http://www.who.int/healthsystems/strategy/everybodys.business.pdf>
- [16] Merson MH, O'Malley J, Serwadda D, et al. The history and challenge of HIV prevention. *Lancet* 2008;372:475–88.
- [17] World Health Organization. *WHO in 60 years: a chronology of public health milestones; 2008*. Available on line at: http://www.who.int/features/history/WHO_60th_anniversary_chronology.pdf
- [18] United Nations. *Global Issues. Health*. Available on line at: <http://www.un.org/en/globalissues/health/>
- [19] Rosenfield A, Min CJ. A history of international cooperation in maternal and child health. In: Ehiri J, editor. *Maternal and child health. Global challenges, programs, and policies*. New York: Springer; 2009. p. 3–17.
- [20] Walsh JA, Warren KS. Selective primary health care: an interim strategy for disease control in developing countries. *New England Journal of Medicine* 1979;301:967–74.
- [21] Rifkin SB, Walt G. Why health improves: defining the issues concerning 'comprehensive primary health care' and 'selective primary health care'. *Social Science and Medicine* 1986;23:559–66.
- [22] Lee K. *The World Health Organization (WHO)*. London: Routledge; 2009.
- [23] Burci GL, Vignes CH. *World Health Organization*. Hague: Kluwer Law International; 2004.
- [24] Lawn JE, Rohde J, Rifkin S, et al. Alma-Ata 30 years on: revolutionary, relevant, and time to revitalise. *Lancet* 2008;372:917–27.
- [25] World Health Organization. *Global strategy for health for all by the year 2000*. Geneva: World Health Organization; 1981.
- [26] World Health Organization. *The world health report 1996 – fighting disease, fostering development*. Geneva: World Health Organization; 1996.
- [27] Feig C, Shah S. Setting the record straight on WHO funding. *Foreign Affairs* 2011. Available on line at: <http://www.foreignaffairs.com/articles/136687/christy-feig-and-sonia-shah/setting-the-record-straight-on-who-funding>
- [28] Brady JP. Marketing breast milk substitutes: problems and perils throughout the world. *Archives of Disease in Childhood* 2012;97:529–32.
- [29] Taylor A. Violations of the international code of marketing of breast milk substitutes: prevalence in four countries. *BMJ* 1998;316:1117–22.
- [30] Ergin A, Hatipoglu C, Bozkurt AI, et al. Compliance status of product labels to the international code on marketing of breast milk substitutes. *Maternal and Child Health Journal* 2012. <http://dx.doi.org/10.1007/s10995-012-0971-9>.
- [31] International Baby Food Action Network. *Breaking the rules, stretching the rules 2010*. Malaysia: IBFAN; 2010.
- [32] Forsyth JS. International code of marketing of breast-milk substitutes—three decades later time for hostilities to be replaced by effective national and international governance. *Archives of Disease in Childhood* 2010;95:769–70.
- [33] Rosenfield A, Maine D. Maternal mortality—a neglected tragedy. Where is the M in MCH? *Lancet* 1985;2:83–5.
- [34] Bhutta ZA, Chopra M, Axelson H, et al. Countdown to 2015 decade report (2000–10): taking stock of maternal, newborn, and child survival. *Lancet* 2010;375:2032–44.
- [35] Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJ. Global and regional burden of disease and risk factors, 2001, systematic analysis of population health data. *Lancet* 2006;367:1747–57.
- [36] Islam M. The safe motherhood initiative and beyond. *Bulletin of the World Health Organization* 2007;85:735.
- [37] Rajaratnam JK, Marcus JR, Flaxman AD, et al. Neonatal, postneonatal, childhood, and under-5 mortality for 187 countries, 1970–2010: a systematic analysis of progress towards Millennium Development Goal 4. *Lancet* 2010;375:1988–2008.
- [38] Murray CJL. *Rethinking DALYs*. In: Murray CJL, Lopez AD, editors. *The global burden of disease*. Cambridge: Harvard School of Public Health on behalf of the World Health Organization and the World Bank; 1996. p. 1–98.
- [39] World Health Organization. *The global burden of disease: 2004 update*. Geneva: World Health Organization; 2008. Available on line at: http://www.who.int/healthinfo/global_burden_disease/2004_report_update/en/index.html
- [40] Marrero SL, Bloom DE, Adashi EY. Noncommunicable diseases. A global health crisis in a new world order. *JAMA* 2012;307:2037–8.
- [41] Andrus JK, Aguilera X, Oliva O, et al. Global health security and the international health regulations. *BMC Public Health* 2010;10(Suppl. 1):S2.
- [42] World Health Organization. *International health regulations coordination department activity report 2011*. Geneva: World Health Organization; 2012. Available on line at: http://whqlibdoc.who.int/hq/2012/WHO_HSE_GCR_LYO_2012.3_eng.pdf
- [43] Stuckler D, King L, Robinson H, Mckee M. WHO's budgetary allocations and burden of disease: a comparative analysis. *Lancet* 2008;372:1563–9.



Japan's Vaccine Service and an Introduction to the History of Cumulative Vaccine Coverage

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Abstract

During the measles epidemic periods in 1999-2003, a research group elaborated a method of estimating vaccination coverage. The objective of cumulative vaccination coverage (CVC) was to estimate the age of vaccine completion for vaccine targets in an age cohort. From randomly selected children of an age cohort, vaccine records including the date of birth and date of vaccine administration were retrieved, allowing for the calculation of the age of vaccine targets. By acquiring this information, it is possible to derive vaccination trends by age. According to the literature, CVC is now more widely applied and is used for monitoring delays of vaccination due to changes of the vaccine administration schedule and schedule interaction when newly-introduced vaccines are implemented. Although CVC is rather costly because it requires random sampling, we conclude that it is a useful method for estimating herd immunity.

Keywords: Cumulative vaccine; Vaccination coverage

Introduction

Assessing vaccination coverage is an essential part of evaluating a vaccination program. The vaccine coverage calculation is, in a word, simple. The denominator is the target population, which is usually defined as the number of children in one targeted area. The numerator is the number of children vaccinated within a certain time period, usually the fiscal year. The measurement of vaccine coverage is simply the numerator over the denominator. However, routine methods sometimes vary and are not always accurate [1,2]. Thus, the method for determining vaccine coverage should be carefully considered.

Japan experienced a series of measles epidemics from 1999-2003. During the epidemic period, a vaccination monitoring method named "Cumulative Vaccination Coverage" (CVC) was devised.

In this article, we first review Japan's vaccination services and the past measles epidemics of 1999-2003 and then introduce the structure of the CVC calculation method and its wider application to the monitoring of vaccination services. We conclude that it is a useful method for estimating herd immunity.

Vaccine Service in Japan

That Japan's vaccine service falls short in comparison to vaccination trend in other developed countries is well-known. This lag can be attributed to several elements, including vaccine gap [3]. Here, we briefly summarize the recent Japanese vaccination situation as it stands at the time of writing (September, 2013).

Prior to 2006, the measles-containing vaccine (MCV) was administered only once to children aged 12-90 months. This changed in 2006 with the revision of Japan's Preventive Vaccination Act. The present two-dose MCV vaccination service was first implemented in Japan after the revision. At the same time, the measles-rubella (MR) vaccine was made available to children [4]. The Bacille de Calmette et Guérin (BCG) vaccination protocol in regular service was changed from a single dose with a tuberculin test before the age of four years to a single dose before the age of six months without a tuberculin test. The change was made due to a review of vaccine services in 2004 [5,6].

The Haemophilus influenzae B (HiB) and pneumococcus vaccines were introduced in 2007 [7,8]. Oral polio vaccine (OPV) was replaced by inactivated polio vaccine (IPV) in September, 2012 and DPT-IPV vaccine was introduced in November 2012 [9]. At present, two-dose MR vaccination and DPT-IPV vaccination have become mainstream, even though monovalent MCV remains available.

With regard to other vaccines, the Japanese encephalitis vaccine is in regular service and is given at the age of three, while hepatitis B vaccine is not a regular service but is given to selected babies born to mothers who are seropositive for HBs-Ag [10,11].

Japan's 1999-2003 Measles Epidemics

During the measles epidemics of 1999-2003, the number of reported cases in Japan ranged from 5,957 (1999) - 34,734 (2001); the estimated total number of cases for this period was 100,000 - 200,000 [12,13]. These epidemics were attributed to insufficient disease suppression due to low vaccination coverage, which ranged from 75 - 81% nationwide [4]. The epidemics were controlled after a nationwide public awareness campaign in 2001, which promoted vaccination with the first dose of MCV soon after the age of 12 months; at the same time, the measles vaccine was offered free of charge, and the two-dose MR vaccine was introduced [14]. According to the latest news, Japan has come to the stage of measles elimination because indigenous measles D5 has not been detected in Japan since May, 2010 [15].

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Research Group Recommends CVC

In 1999, a research group tasked with controlling the national measles epidemics was organized with funding from the Ministry of Health, Labour and Welfare. This group was organized with the expectation that it would make recommendations for controlling measles epidemics. It actually made several recommendations, one of which was introducing CVC to monitor national vaccination coverage.

Dr. Hiroshi Sakiyama, one of the members of the research group devised the CVC protocol. Its purpose was to retrieve the age (in months) of the children when they were vaccinated. The principle is as follows:

- 1) The objective is to grasp the vaccination trends of the children in an age cohort (originally, all children nationwide who had reached their 3rd birthday).
- 2) Even if exploring nationwide coverage, the minimum required number is about 2,500, which can be randomly selected from government registries in Japan from a total of approximately 1,000,000 total births.
- 3) Vaccine records for the vaccinated children, which include date of birth and vaccine administration, are retrieved. The age (in months) of vaccine targets can then be calculated.
- 4) By accumulating the age (in months) of vaccine targets, vaccination trends by age can be derived from the children who are randomly selected from an age cohort.

As Figure 1 shows, vaccination coverage at a certain point of age can be identified in the age cohort. The steeper the curve rises, the greater the number of children who are immunized by an earlier age [16].

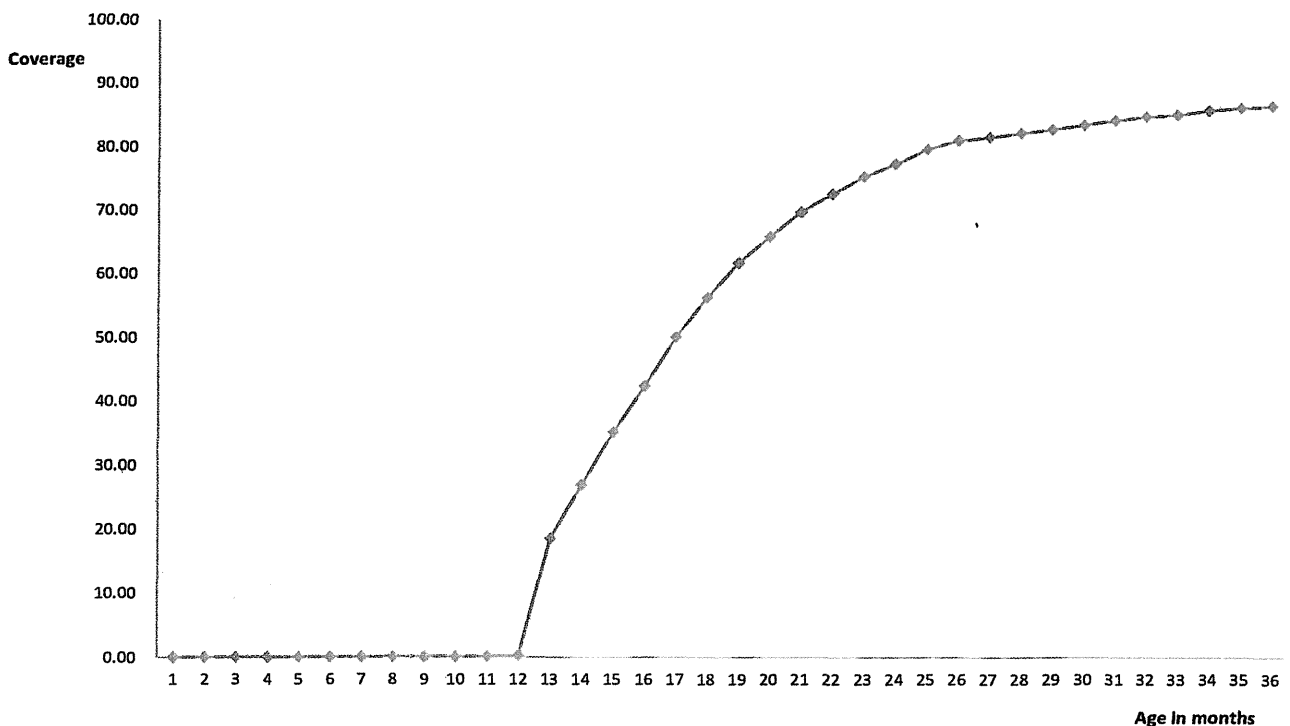


Figure 1: National cumulative vaccination coverage by age (in months).

Wider Application of CVC to Monitoring

We searched the *Ichushi* database of medical abstracts, which covers almost all medical Japanese medical publications, for the keyword "*Ruiseki Sesshuritsu*" (Japanese: cumulative vaccination coverage) (final search: September 18, 2013), with conference abstracts excluded from the search terms. The search yielded 46 published articles published from 1999 - 2013, all of which were written in Japanese. Five articles discussed the methodology of CVC and 41 were original articles describing studies that made use of the CVC.

The 41 original articles examined the following target vaccines (10 articles covered more than one vaccine): MR (12 articles), BCG (11 articles), MCV (10 articles), OPV (10 articles), Japanese Encephalitis (5 articles), Diphtheria-Pertussis-Tetanus vaccine (5 articles), Rubella vaccine (4 articles). The monitoring of the effects of delays of BCG and MR vaccination due to the change of the vaccine administration schedule was examined by one author [17], while another examined vaccine administration schedule interaction, and delay of vaccination due to the newly introduced Hib and pneumococcus vaccines with respect to DPT and OPV [18].

Strengths and Weaknesses of CVC

When we consider the strengths of CVC, we can conclude that it is useful for estimating the herd immunity of an age cohort. Currently, the World Health Organization (WHO) recommends the "lot quality technique", which can be applied even in developing countries [19,20]. However, as Sakiyama noted, the core objective of lot quality technique is to understand the percentage of people who received a vaccine, not the age at which the vaccine was administered [21]. CVC can monitor the trends in age of vaccine recipients. If we extend the targets to more than one age cohort in the planning stage of the survey, the herd

immunity of a community can also be estimated. Japan used to adopt an original method for calculating vaccine coverage. The numerator of vaccine coverage was the number of children vaccinated. When children are vaccinated, their parent/guardian is given a questionnaire, with questions on the physical health of the vaccine. The number of children vaccinated was taken from the number of questionnaires collected. The denominator was "the number of target age children" plus "the number of children left unvaccinated from previous vaccination sessions". The number, in principle, increases year by year if the targeted children are left unvaccinated [21]. However, it is sometimes hard to follow the number of unvaccinated children, resulting in unreliable vaccine coverage. Since CVC is calculated from random sampling, the above mentioned uncertainties can be avoided. On the other hand, CVC has a weakness in that it can sometimes be costly to retrieve randomly sampled data. A cost analysis of CVC may be the subject of future research.

Conclusion

We have reviewed the contents of CVC from its theoretical background to its application to the monitoring of several vaccine services. Despite the random sampling requirement, the strength of the CVC is that it can monitor the herd immunity among age cohorts.

Authors' contributions

KT wrote the first draft of the manuscript. KT and HK discussed and modified the final draft of the manuscript.

References

1. Guérin N (1998) Assessing immunization coverage: how and why? *Vaccine* 16 Suppl: S81-83.
2. Murray CJ, Shengella B, Gupta N, Moussavi S, Tandon A, et al. (2003) Validity of reported vaccination coverage in 45 countries. *Lancet* 362: 1022-1027.
3. Igarashi T (2008) A vaccination system below the global standard.
4. Takahashi K, Ohkusa Y, Kim JY (2011) The economic disease burden of measles in Japan and a benefit cost analysis of vaccination, a retrospective study. *BMC Health Serv Res* 11: 254.
5. National Institute of Infectious Diseases (2007) Amendment of the Infectious Diseases Control Law, Japan, as of June 2007. *IASR* 28: 185-188.
6. Yamamoto S, Yamamoto T (2007) Historical review of BCG vaccine in Japan. *Jpn J Infect Dis* 60: 331-336.
7. Ihara H, Suga H, Asada K, Togashi T, Hosoya M, et al. (2012) Effect of introduction of Hib vaccines and 7-valent pneumococcal conjugate vaccines (PCV7) on invasive bacterial infections: report of a study group (2008-2011). *IASR* 33: 71-72.
8. National Institute of Infectious Diseases (2010) Invasive Haemophilus influenzae type b infection and Hib vaccine, Japan. *IASR* 31: 92-93.
9. Ministry of Health, Labour, and Welfare, Japan (2012) Basic information on polio and polio vaccines.
10. Shiraki K (2000) Perinatal transmission of hepatitis B virus and its prevention. *J Gastroenterol Hepatol* 15 Suppl: E11-15.
11. Takahashi K, Kobayashi J, Sugiura Y (2012) The relevance of Japan's hepatitis vaccine policy to national Hepatitis B prevention and control. *J Public Health Policy* 33: 136-138.
12. Japan Pediatric Society, Japanese Society of Child Health, Japan Pediatric Association (2001) A written request for implementation of effective control measures of measles epidemics. Submitted to the Ministry of Health, Labor and Welfare in July, 2001. *IASR* 22: 285-286.
13. Gomi H, Takahashi H (2004) Why is measles still endemic in Japan? *Lancet* 364: 328-329.
14. Centers for Disease Control and Prevention (CDC) (2008) Progress toward measles elimination--Japan, 1999-2008. *MMWR Morb Mortal Wkly Rep* 57: 1049-1052.
15. Yomiuri Shimbun (2013) Measles is eliminated, indigenous type virus has gone.
16. Sakiyama H, Umemoto S, Takayama N (2003) The national cumulative vaccination coverage of measles obtained by nationwide survey. *Nihon Iji Shinpo* 4150: 26-29.
17. Takayama N, Sakiyama H, Okabe N, Shimizu H, Miyamura T, et al. (2011) Cumulative vaccination coverage of BCG vaccine, diphtheria-pertussis-tetanus trivalent vaccine, oral polio vaccine and measles-rubella bivalent vaccine obtained by the nationwide survey in the year 2009. *Shonika Rinsho* 64: 963-971.
18. Takayama N, Sakiyama H, Okabe N, Shimizu H, Miyamura T, et al. (2011) Cumulative vaccination coverage of BCG, diphtheria-pertussis-tetanus, oral polio vaccine, and measles-rubella bivalent vaccine obtained by the nationwide survey in the year 2009. *Shonika Rinsho* 64: 2393-2400.
19. Robertson SE, Anker M, Roisin AJ, Macklari N, Engstrom K, et al. (1997) The lot quality technique: a global review of applications in the assessment of health services and disease surveillance. *World Health Stat Q* 50: 199-209.
20. Cakir B, Uner S, Temel F, Akin L (2008) Lot quality survey: an appealing method for rapid evaluation of vaccine coverage in developing countries - experience in Turkey. *BMC Public Health* 8: 240.
21. Sakiyama H (2004) Current trends of vaccination coverage. *Shonika Shinryo* 67: 2086-2091.

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