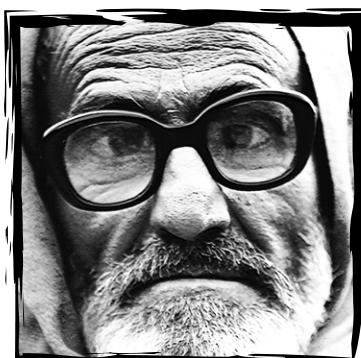


Report

WHO Global Forum on Innovations for Ageing Populations

10-12 December 2013 Kobe, Japan



Acknowledgments

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The World Health Organization (WHO) Centre for Health Development (WHO Kobe Centre) organized and convened the Global Forum in collaboration with a number of WHO colleagues, departments and levels. In addition to the WHO Kobe Centre staff, the following people contributed to the organization of the Global Forum: Martin Friede and Francis Moussy, Office of the Assistant Director-General for Health Systems and Innovation; John Beard, Department of Ageing and Life Course; Somnath Chatterji, Health Statistics and Information Systems Department; Adriana Velazquez-Berumen and Yukiko Nakatani, Medical Devices Unit of the Department of Essential Medicines and Health Products; Chapal Khasnabis, Disability and Rehabilitation Unit of the Department of Violence and Injury Prevention and Disability; Ivo Kocur and Shelly Chadha, Prevention of Blindness and Deafness, from the Department of Management of Noncommunicable Diseases; Shin Young-soo, Regional Director; and Anjana Bhushan of the Regional Office for the Western Pacific.

The Global Forum was further based on preliminary work conducted by these individual WHO departments, and others not mentioned.

This report was written by Paul Rosenberg, Consultant, with Alex Ross, Director, and Loic Garçon, Technical Officer, Innovation for Healthy Ageing of the WHO Kobe Centre.

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WHO Global Forum on Innovations for Ageing Populations

10-12 December 2013 Kobe, Japan

Abbreviations

HTA	health technology assessment
LMIC	low- and middle-income countries
NCD	noncommunicable disease
OECD	Organisation for Economic Co-operation and Development
WHO	World Health Organization

About the Global Forum on Innovation for Ageing Populations

In 2013, the World Health Organization established the Global Forum on Innovation for Ageing Populations as a platform for diverse stakeholders to exchange information and collaborate on meeting the needs of older people in low resource settings with frugal innovations. Rapid population ageing in low- and middle-income countries is an emergent, unprecedented dynamic with unique implications and opportunities for these societies, as well as for other more aged societies. The Global Forum introduced the first opportunity to link and discuss new evidence of the ageing phenomenon together with the latest social and technological innovations in potentially cost-effective, scalable solutions. The discussions revealed new thinking about designing and adapting effective solutions, as well as the data and evidence needed to encourage further innovation.

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Forewords



Dr. Marie-Paule Kieny

Assistant Director-General
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We live in a rapidly ageing world, a global phenomenon with the greatest growth in low and middle income countries. This unprecedented longevity is the product of success in public health, medicine, as well as improvements in socio-economic conditions around the world. Such success, however, brings new challenges and opportunities. How best can we ensure that older populations maintain their health, productivity, quality of life, dignity, and autonomy for as long as possible? How to ensure equity of access to quality health services? How to increase the social participation of elder citizens and engagement in their health, and to prevent disease as well as functional and cognitive decline? How to reduce institutionalization and keep health and social costs to a minimum? The answer lies, in part, in harnessing the power of innovation.

This was the motivation behind our organizing the first World Health Organization (WHO) Global Forum on Innovation for Ageing Populations in Kobe, Japan. We are grateful to the over 170 participants from 21 countries that willingly shared their time, expertise, experiences, and ideas. The Forum was a landmark event that explored, documented and promoted technological and social innovations that can make an enormous difference in people's lives, especially when conceived as "frugal" and which are to a number of national and local contexts.

The WHO Center for Health Development (also known as the WHO Kobe Centre), located in Kobe, Japan, organized the Forum and is striving to advance technological and social innovation for ageing populations. I am thankful for their work, as well as to the many contributions and insights provided by researchers, colleagues, and participants from Hyogo Prefecture, Kobe City, and throughout Japan.

The Forum highlighted a number of examples of innovations, as well as opportunities and challenges/barriers to realize greater access to and availability of affordable innovations. The world is at a "tipping point" whereby we can harness the benefits of frugal, adapted and disruptive innovations of low cost health and information technologies to meet the needs of the fastest growing demographic group in the world.

Moving forward, WHO will continue to catalyze and promote innovations for ageing populations and to address various issues in the innovation cycle that require attention to ensure their rapid diffusion and use in countries and communities. Designing and implementing a Universal Health Coverage approach can greatly facilitate access to appropriate innovations for this population. The Forum demonstrated the power of sharing ideas across multiple stakeholders and disciplines. My hope is that this report will generate further ideas and innovations to make a real difference in the lives of older persons.



Alex Ross
Director WHO Centre
for Health Development
Kobe, Japan

The WHO Centre for Health Development is proud to have organized the WHO Global Forum on Innovation for Ageing Populations. Drawing on expertise from Japan, including Hyogo Prefecture and Kobe City, from countries around the world, and from representatives of government, industry, non-governmental organizations, academia, the Forum facilitated a rich exchange of ideas and solutions. We are thankful to all of the Forum participants for their active engagement.

Our collective purpose was to chart a course for all stakeholders to prioritize development and diffusion of health technology and social innovations to address the most common health conditions and needs of older persons experiencing various levels of physical and cognitive functional limitations and decline, as well as to enable greater social inclusion.

Consensus was reached that innovation requires integrated health systems and policy approaches (such as Universal Health Coverage), new service delivery models, attention to different incentives and ensuring affordability, and ways to link users, government, producers, and health/social service professionals. Engaging older persons in articulating their needs and preferences for technologies and services, and in the design and diffusion of innovations, was echoed throughout the Forum.

Despite the abundance of health technologies, and an era of unprecedented technological advances, there remain enormous gaps in the availability of affordable, safe and effective, and appropriate (to the user) health technologies. These include the most basic of assistive health technologies required to address the needs of older persons such as low vision, hearing, mobility, major non-communicable disease and their co-morbidities, and cognitive functioning.

The WHO Center for Health Development was created in 1995 as a global centre for excellence to conduct research on the consequences of social, economic, and environmental change and its implications for health policies. In this context, we are leading work with many WHO colleagues to research and disseminate means to promote technological and social innovations for healthy ageing, and to better understand the respective drivers, limits and opportunities.

The Forum was a beginning. We hope that it encourages greater creativity, sharing of ideas and networking to drive innovation that enables older populations maintain their health, productivity, social participation, autonomy, and to retain their dignity.

Executive summary

Background

Population ageing has become a global phenomenon. While it is widely recognized that the more developed nations have been growing proportionally older for some time, the pace of population ageing is accelerating in virtually every society today. Over the next 40 years, older people in developing countries will come to outnumber people of all ages in developed countries. This illustrates how quickly the older adult population is growing in low- and middle-income countries (LMICs) and how large it will become. In that time, developing countries will become home to approximately 80% of the older adults worldwide.

LMICs face a more complex ageing experience. As these societies age, they will have to manage the double burden of infectious and parasitic disease along with the rise of noncommunicable diseases (NCDs) and disability. Moreover, adults in these contexts generally develop NCDs at younger ages, have less awareness of NCDs and their risk factors, and experience more difficulty managing these diseases when they have them. Lower resource environments, as well as poverty, further complicate the ability of families and health systems to respond to the health challenges that arise with ageing.

Objectives

In 2013, the World Health Organization (WHO) established the Global Forum on Innovation for Ageing Populations as an information exchange platform for diverse stakeholders to address the challenge of meeting the needs of older people in low resource settings with frugal innovations. The Global Forum brought together more than 170 expert participants from 21 countries for 3 days of rich discussion and debate, in order to meet the following objectives:

- exchange information, views and lessons from key operations and health systems research concerning technological and social innovations for ageing populations;
- highlight findings and solutions through specific examples of successful, scaled-up innovations;
- identify key future priorities for WHO and its partners in support of innovations for ageing populations.

Results

The Global Forum introduced the first opportunity to link and discuss new evidence of the ageing phenomenon together with the latest social and technological innovations in cost-effective, scalable solutions. The evidence was derived from a wide range of sectors and stakeholders with a common concern for the health and welfare of older adults, especially in lower resourced settings and countries. When woven together, the data presented conveyed several key trends underpinning the pressing need for innovations. First, that the LMICs will soon have large populations of older adults, and will face the double burden of infectious and parasitic disease as well as NCD at scale. Secondly, evidence points to a widening gap between life expectancy and healthy life expectancy, due at least in part to lengthening of human life while the burden of disease and disability is growing, and affecting people at younger ages. Functional and cognitive decline will increase. Many of the resulting disabilities and morbidities are often preventable or at least delayed by accessing preventive care, which strongly advocates for universal health coverage, a life course approach to health, and education. The impacts of ageing on health systems financing, and on the greater economy of these societies, can be structurally disruptive in terms of the adjustments required to meet changing needs, but are far from being catastrophic or insurmountable.

Forum participants presented innovations that support healthy ageing and greater individual autonomy resulting in higher quality of life, improved health and other positive impacts on the lives of older adults, their caregivers and society as a whole. A wide range of exemplary innovations were presented in sessions ranging from cutting edge technologies, to technology-free, simple methods for diagnosing and managing the health of older adults in low resource settings. Presenters also proposed new thinking that can improve care and support systems, and potentially bend the cost curve.

Discussions throughout the Global Forum focused on how best to enable innovation, and ensure that future innovations are appropriate, affordable, acceptable, accessible, safe and effective for a growing population of older adults in the developing world. Towards meeting these requirements, emphasis was placed on identifying the needs and preferences of older adults, disentangling complex health and social issues, and feeding this critical information back into innovations and government policies. Participants discussed design principles that can help guide new innovations, as well as experiences in taking innovations from the seed of an idea to ultimately benefitting the end-user. This included discussions on crucial regulatory steps and evaluations for getting products to market, securing the required reimbursement and financing, and producing impact for positive health outcomes.

Moving forward

The Global Forum effectively created a platform to share information, debate and drive new thinking about the current and emerging health and social challenges for ageing populations in low resource settings, as well as about developing, adapting and empowering innovations to meet these challenges. However, much work remains to be done. Few innovations have been designed specifically for this target demographic, just as few are uniformly affordable, accessible, acceptable or sustainable in these contexts.

Innovations presented during the Global Forum showed that these ambitious requirements are attainable. WHO's aim for the Global Forum is to support these first waves of innovation, and where possible, to enable new innovations. WHO will continue to facilitate access to the most up-to-date demographic, health and economic evidence for innovators, implementers and policy-makers. It will also close the feedback loop so that consumers of data can feed back to researchers the perceived data needs and gaps in the science. Efforts will continue to create networks among both familiar stakeholders and unconventional partners in new ways, in order to identify synergies and opportunities across sectors and the public-private divide. The time in between subsequent Global Forums presents a valuable opportunity for WHO and its partners to fill in the evidence gaps and to build tools and other infrastructure necessary to catalyse and promote innovation.

Chapter 1 – Introduction

One of the most significant health achievements of the last century has been the increasing survival and longevity of adults across the income spectrum worldwide. As many have suggested, this is unquestionably a cause for celebration and is the result of numerous extraordinary successes including improvements in nutrition, water and sanitation, and prevention and control of infectious and parasitic diseases. These successes dramatically reduced preventable mortality, allowing most parts of the world to add as many as 30 years to human life expectancy. Meanwhile, as we have begun to live longer, families around the world have also gradually begun to have fewer children. In societies where these two demographic dynamics happened quickly and simultaneously, there emerged large, young and educated labour forces alongside smaller dependent populations, yielding great economic rewards. Commonly called the “demographic dividend”, the benefits accrued from these effects bolstered efforts to reduce preventable mortality, and continued the trend of declining fertility. In the long run, populations of individuals living longer and having smaller families inevitably results in population ageing.

Population ageing is now a global phenomenon, and is no longer an emerging trend limited to the higher income world. The pace of societal ageing is accelerating in virtually every country, regardless of wealth. The older segment of the world population is already outpacing the growth rate of the total population, and the gap between these growth rates continues to widen. With these growth trajectories locked in, for the first time in human history, the population of older adults will soon outnumber the young children of the world.

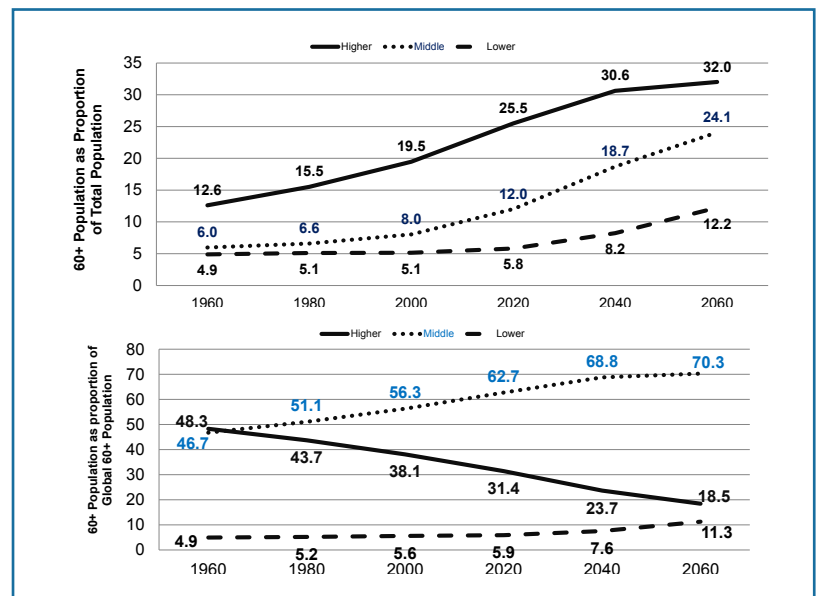
Older societies are quickly becoming the new normal of our world. Therefore, one of the great public health challenges of our time will be to ensure that older adults continue to have access to the means to age well – healthily and autonomously. The challenge demands a swift response, as the pace of demographic change continues to hasten, and the consequences of inaction only worsen with time. It is precisely the grand scale of this emerging, diverse population of older adults, and its health needs that requires the world to innovate new cost-effective solutions. The Global Forum on Innovation for Ageing Populations is the first major step taken by the World Health Organization (WHO) to build the interdisciplinary network needed to address these issues, and to arm this network with the data and evidence it needs to innovate solutions.

This report presents a summary of the rich discussions and ideas presented during the Global Forum. It does not capture all of the specific presentations and concepts. To ensure equity, the report does not name individuals who presented their ideas (some of which are not yet published). However, Annex 2 contains a list of participants, including presenters, for those who wish to follow up with these individuals.

Chapter 2 – The case for innovation

The sense of urgency around the issue of ageing is already being felt in the highly developed nations of the world, where the speed of societal ageing continues to gain, and the stress on social safety nets has begun to be felt. By 2050, at least a quarter of the individuals in these nations will be over 65 – half of whom will be over 75. This has given rise to great concern about how these nations will be able to cope with a proportionately large population of older adults with unique and sometimes considerable health, social and financial needs. However, necessity and opportunity have given rise to a legion of global innovators, individuals and institutions that work to design solutions to many of the challenges of rapid societal ageing, once thought to be insurmountable. Innovations have emerged in pharmaceuticals, assistive devices, robotics, sensor systems, e- and m-Health, as well as strategies for health systems and social support, many of which were presented at the Global Forum. The emerging innovation landscape gives compelling reasons for optimism that older adults in the higher income world may be able to maintain a good quality of life as they age, and extend their healthy life expectancy.

Nearly every country in the world is ageing, and soon the largest population of older adults in history will live in the developing world.



Data via UN Population Division 2013. Presentation by Paul Kowal, University of Newcastle, Australia

Low- and middle-income countries (LMICs) face a more complex ageing landscape, where a larger scale ageing population, greater heterogeneity, fewer resources and established systems, and more difficult health and quality of life considerations create a new set of challenges. The challenge begins with the extraordinary scale of the ageing population in the LMICs. As presented at the Global Forum, in 2050 about 80% of the world's population of older adults will reside in countries currently identified as LMICs. To give a sense of scale, this equates to more than the projected total population of the higher income nations combined. China will be home to

an older population exceeding 330 million and India 200 million. If these retirement-age populations in India and China were countries, they would be among the 10 largest nations in the world. In the same timeframe about a quarter of the population of Latin America and the Caribbean region will be over 60. Similarly, the African continent will have doubled the proportion of its population over 60 at this time.¹ This is uncharted demographic and health territory for these societies, and it is happening at a pace that demands the urgent development of solutions.

Nations in the developing world, where once-bulging youth populations were the dominant demographic feature, must now manage the health and welfare of these cohorts as they grow into older age. More than 87% of the burden of disease for older adults comes from noncommunicable diseases (NCDs) – conditions such as diabetes, heart disease, chronic respiratory disease and cancer, among others that typically manifest later in life. Lifestyle and environmental factors impact on the rise of NCDs worldwide; however, irrespective of wealth and geography, they will also increase as a result of the epidemiological consequences of ageing. However, while developing country citizens may suffer from the same NCDs as their higher income counterparts, the evidence indicates that their impact is significantly worse in LMICs. Individuals in LMICs develop NCDs earlier in life, and may not have access to the necessary treatment or prevention. The same pattern may hold true for large pockets of poor populations in developed countries. This begs the question of whether chronological age is the right measure for ageing, and whether the population that is experiencing ageing, in terms of progressive health and functional loss, is actually even greater in LMICs than previously thought. Furthermore, NCD mortality rates are more than twice as high in LMICs as they are in higher income countries at all ages. More than 90% of early preventable death caused by NCD occurs in the developing world;² this is corroborated by evidence from the WHO Study on Global Ageing and Adult Health (SAGE)³ showing poor awareness and diagnosis, and much worse rates of effective control over NCD. Even when nonfatal, NCDs have a significant impact on the lives of those living in LMICs through illness, disability, and diminished quality of life. Ultimately, ageing-related disease and disability lead to a comparatively lower healthy life expectancy in LMICs – the average number of years an individual can expect to live without disability or disease.

The challenge of meeting the needs of ageing low- and middle-income societies is further complicated by resource-constrained environments and the high burden of infectious and parasitic diseases. Efforts to strengthen

¹ Demographic projections sourced from World population prospects: The 2012 revision. United Nations. (<http://esa.un.org/unpd/wpp>, accessed 8 May 2014).

² Alleyne et al. Embedding non-communicable diseases in the post-2015 development agenda. *Lancet*. 2013;381:566-74.

³ See www.who.int/healthinfo/sage/en/

The gap between life expectancy and healthy life expectancy is widening.

The Compression of Morbidity?

- As life expectancy increases, the gap between life expectancy and healthy life expectancy also increases.
- As age increases the gap between healthy life expectancy and life expectancy widens even more, and this effect is greater for women than for men.

Presentation by Somnath Chatterji, World Health Organization.

the response to population ageing must contend with limited capacities to deliver or access services that are under strain from managing various diseases. Meanwhile, responding to ageing populations poses new health planning demands: physicians will require additional, appropriate training to care for older adults; a greater supply of sufficient lower level service providers will need to be developed; and procurement and management of health commodities needs to be improved in LMICs.

These health system challenges are wide in scope, reflect broader limitations, and have raised questions about the sustainability of health financing given increased expenditures attributed to older adults. However, research presented at the Global Forum suggests that the effects of ageing on health care spending were not as great as predicted. Research conducted by the Organisation for Economic Co-operation and Development (OECD) found lower than expected ageing effects on health care spending in both the OECD nations and the emerging BRIICS economies.⁴ Moreover, research on societal ageing in the OECD suggests that it will only modestly impact economic growth. While there are clearly great differences between the contexts of the high income nations and LMICs, the more modest effects of rapid ageing dynamics in the higher income nations suggests some optimism for the ageing experience in LMICs.

While we know comparatively less about the potential impact of ageing on health financing in LMICs, International Monetary Fund data presented at the Global Forum further suggests that while ageing will have an impact on public health care spending, other factors such as technological change will be more significant drivers of increasing spending in emerging economies. That said, while the financial impact is not predicted to be catastrophic, it still represents an important, complex concern for decision-makers. Without additional data and research, the picture is still unclear, particularly as health coverage and long-term care schemes continue to evolve in LMICs, thus driving up demand as well. Furthermore, supporting healthy ageing will no doubt present significant challenges for relatively poorer households in low resource environments in LMICs.

⁴ BRIICS describes the group of emerging economies which includes Brazil, the Russian Federation, India, Indonesia, China and South Africa.

The needs for innovation to meet the opportunities and challenges presented by ageing in low resource settings are both wide-ranging and urgent. With a projected population of more than 1.6 billion older adults in the developing world, there is an emerging, large-scale need to improve the access of this older population to health services and commodities. This underscores more than ever the need for universal health coverage to ensure that every older adult has the access they need to live more healthily as they age. New innovations in medicines, assistive devices, home-based care and community-based support will be needed in order to ensure that longer lives are lived well and as autonomously as possible. The current suite of health systems, commodities, socioeconomic and political solutions were designed in higher income nations, under conditions of long established social safety nets, strong health systems and a relatively wealthier class of older adults. It is thus crucial to develop frugal, but high quality innovations that are scalable within populations and across borders. However, there is need to uncover key health and welfare needs of older people in the developing world to ensure that innovations are acceptable, appropriate and affordable for the way they choose to live their lives.

Chapter 3 – Trends in innovation for ageing and health

3.1 Community and home-based care

In societies with rising numbers of ageing adults, policy-makers often face increasing concerns about the health system's ability to deliver adequate-quality care for growing numbers of older individuals, while keeping costs manageable and the health system's finances sustainable. Participants in the Global Forum observed presentations of technologies and social innovations that may help mitigate these issues and improve care for individuals at a lower cost. However, innovations to enable health systems to make adjustments to the ways that they care for older adults may also be necessary in the long run. Evidence presented suggests that community and home-based care could simultaneously reduce cost and improve care. It also has the essential benefit of improving autonomy and giving older individuals the power to make their own decisions over their health and daily living.

Visualization of a new integrated health and social services strategy in Canterbury, New Zealand.



Presentation by Carolyn Gullery, Canterbury District Health Board, New Zealand.

Presentations at the Global Forum indicated that higher than necessary rates of hospitalization and emergency department use, as well as institutionalized long-term care could be significant concerns as drivers of health care costs and inefficient care. The costs of caring for patients in a hospital setting when they could otherwise receive appropriate support in nursing homes, or better still in their own homes, are significant and potentially avoidable. Data from Ontario, Canada indicated that as many as 37% of hospitalized older patients designated for nursing homes could have been cared for at home. In the Canadian data, 1 day in a hospital bed cost more than seven times as much as 1 day in a nursing home, and more than 18 times as much as 1 day of home and community-based care. Similarly, projected increasing costs associated with over-hospitalization of the ageing population in the Canterbury district of New Zealand predicted the need to expand the physician workforce by 20% and construct a new hospital. Concern extends beyond simple cost accounting: using

hospital beds and hospital personnel when it may not be necessary for monitoring or treatment also has a health cost. Physicians and hospital resources allocated to an unnecessarily hospitalized patient could be used to care for other patients. This may be particularly important in societies with long wait times to see a physician or receive treatment, in addition to the aforementioned cost implications.

The innovations in community and home-based care presented at the Global Forum offer new approaches to delivering care, while trying to bend the cost curve, and supporting ageing in place. These programmes focus on preventive care and health promotion. Physicians and community-based nurses can make home visits, which can ensure that all home-based older adults can receive primary care. This may be particularly important for frail, cognitively impaired and other homebound adults, who might not have otherwise accessed health care services. Community-based health professionals or pharmacists can work with older adults in their homes to support self-management of patient medications. Social workers and other professionals from within the community can also be mobilized to provide additional support services, such as training to prevent falls. These services can work in concert with one another, based on plans that can be developed by the patient together with their caregivers. In the example presented of Canterbury, New Zealand, these coordinated services were supported by electronic records and protocols shared across all of the patient's caregivers.

Another effective community-based care example presented at the Global Forum revealed an approach deployed in rural Uganda, where community-based workers were trained to identify health and support needs together with older adults. Through this method, older adults were enabled to take charge of their life and health choices, as informed by their revealed health needs. Subsequently, members of the community work together with older community members to develop plans to fill gaps in their care. The goal is to provide as much care as needed in the community in order to maintain health and independence, and to make trips to health centres only when necessary.

Even robust preventive care and health promotion cannot always prevent older adults from having urgent health needs or from needing more advanced care in a hospital setting, but community-based care can provide critical support even in these situations. Both the Ontario and Canterbury programmes train emergency medical technicians to assess the health needs of the patient and to make a determination of whether an emergency department admission is necessary, or if appropriate care can be delivered within the community. The Canterbury programme training led to a 32% reduction in emergency department admissions

for their patients with chronic obstructive pulmonary disease, who were treated in their own community instead. Patients who have been admitted to hospitals can often be transitioned back to their homes, where rehabilitation and other support services can be mustered to replace nursing home or hospital-based care, and to prevent future readmission.

The results of implementing these programmes are compelling. The Ontario programme managed to cover 250 patients on a budget comparable to only 10 patient-years of nursing home care. International evidence presented at the Global Forum also points to decreased emergency department visits, hospitalizations and long-term care admissions, as well as improved immunization rates, advance care planning, and importantly, reported quality of life. The Canterbury programme also demonstrated reduced emergency department visits, hospital admissions, length of hospitalization and readmission rates. Canterbury reduced nursing home admissions by 20%, and duration of nursing home stay by 25%.

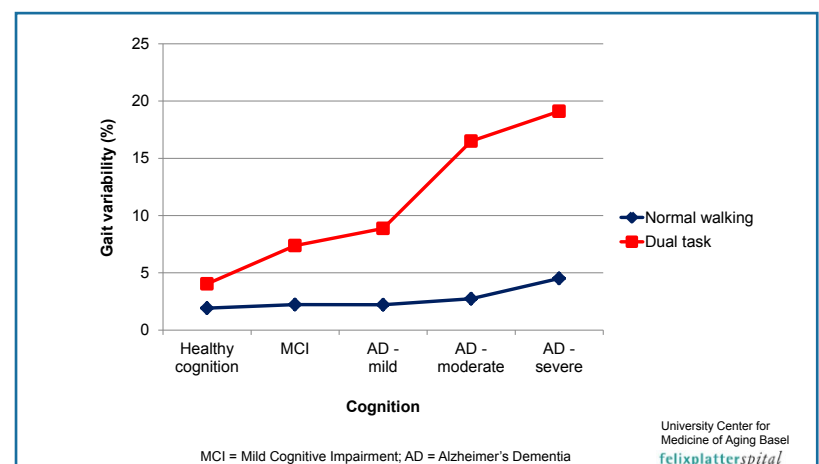
3.2 Fall prevention and mobility

Falls are among the more significant challenges to the health and independence of older adults as they age. One third of all adults over the age of 65 fall at least once a year, and that risk increases with age as physical and cognitive capacity decline, along with a range of other risk factors associated with older age. Falls are the leading cause of injury among older adults. One in every three individuals experiencing a fall sustains moderate to severe injuries. Moderate injuries can constrain mobility and functional independence. Severe injuries can cause significant loss of health and independence, leading to hospitalizations, disability and even death. Hip fractures are among the most concerning of these injuries; they are not only the most common bone fracture resulting from falls among older adults, but they also result in extremely poor health outcomes. One in every five older individuals dies within the first year of sustaining a hip fracture, while others may have significant loss of mobility and quality of life. In addition to health loss, falls may also have a social cost – they may result in social isolation, from lost mobility or fear of another fall or further injury.

The Global Forum featured two major types of innovative solutions to prevent falls. One of the key areas of innovation is in the early identification of fall risk. Muscle weakness and balance deficits are among the leading risk factors for falls, and with proper screening or medical supervision, may be clearly identifiable. However, walking requires a complex combination of cognitive functions involving multiple parts of the brain with physical function. Strictly testing physical ability may therefore not reveal a significant proportion of older adults at risk of falling. Innovations presented

at the Global Forum test for the weaknesses in the complex processes between cognitive and physical function that govern walking. They include simple, portable devices that can precisely measure gait regularity – the ability to produce similarity between consecutive strides when walking. Stride variability has been shown to be associated with cognitive impairment, where even mild cognitive impairment can cause significant gait variability. Gait irregularity has recently been cited as a leading indicator of impending cognitive decline, but it also has significance for fall prevention – as even a 1.7cm change in stride length can nearly double the individual's fall risk. At-risk individuals may have a regular gait when focused on their stride, but reveal stride variance when asked to perform other simultaneous cognitive tasks. Another innovation presented at the Global Forum introduced sensor technologies that passively collect data about the user's stride through normal everyday activity. In either case, quantitative gait analysis can identify fall risk associated with cognitive and physical function before other risk factors manifest.

Gait variability increases as cognition worsens.



Presentation by Dr. Stephanie A. Bridenbaugh, Basel Mobility Center, University Center for Medicine of Aging, Felix Platter Hospital.

Early identification of fall risk provides a window of opportunity to intervene with a number of innovative solutions to reduce risk. Innovations presented at the Global Forum offer a variety of approaches for training the body and the mind to prevent falls. One innovation used an e-Health approach,⁵ with older adults engaged in a fitness class together with the instructor in virtual space, using the standard sensors on the latest gaming consoles. Similar approaches use instructional videos to allow users to do exercises in their own home specifically tailored to improve balance and prevent falls. Other new approaches presented at the Global Forum work to train the body and mind simultaneously, to build both strength and multitasking capability. Experimental results show that multitasking is a trainable skill, including in older individuals, with the intervention group showing reduced gait variability while dual-tasking, and significant

⁵ The WHO defines e-Health as the use of information and communication technologies for health.

reductions in fall risk after 6 months of once weekly training. Finally, one of the approaches presented to reduce falls more broadly was to improve the walkability of cities. Creating an environment that enables physical activity for people of all ages, including the elderly, can be an effective prevention strategy for physical and cognitive decline, as well as preventing social isolation.

Falls and lost mobility share similar risk factors – musculoskeletal and neurological decline, the age friendliness of the environment, as well as behavioural and socioeconomic factors. Injuries and disabilities sustained by falls may also often be the cause of lost mobility. Mobility loss can significantly limit the health and independence of older adults. Limited mobility can constrain an individual's ability to perform everyday activities and engage in social interaction. It can also prevent older adults living alone from seeking or obtaining medical care.

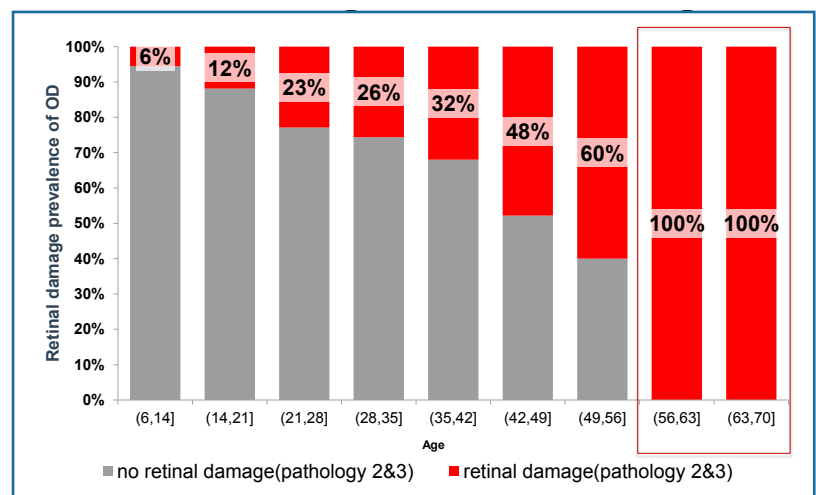
The current suite of mobility solutions include walking assistance devices such as canes or walkers, and seated mobility devices such as wheelchairs. However, there may yet be significant room for innovation, particularly for lower resource environments. One of the innovative concepts presented at the Global Forum addressed adapting the standard design of the wheelchair to lower resource environments. Standard wheelchair designs may not be as suitable for users in LMICs, where difficult terrain may limit mobility or pose a safety risk, even when the user is assisted. Standard wheelchair designs may also be challenging to maintain or repair in these contexts, as they may require uncommonly available parts and expertise to maintain. However, a wheelchair innovation presented at the Global Forum illustrates one example of how an essential device can be adapted and designed specifically for the needs of users in low resource settings. The wheelchair has the capability to operate over difficult, uneven terrain as well as indoor environments. The design is more efficient – it can transfer more energy per stroke to the wheels than the standard push rim design. It is also made with ubiquitous bicycle parts, to enable affordable maintenance and repairs. The design may work well for older adults with disabilities in developing countries, but the design process may be equally important – innovations for healthy ageing in LMICs need to meet the unique life circumstances and requirements of ageing in these contexts.

3.3 Sensory impairment

Many of the most common conditions associated with aging, such as vision loss or hearing impairment, are both highly treatable and disproportionately located in developing nations. Presentations at the Global Forum indicated that more than 90% of the world's visually impaired live in

developing countries, and more than two thirds of the 628 million people with hearing loss live in LMICs. While vision and hearing loss are not strictly the result of biological ageing, sensory impairment is widespread in the older population. Older adults account for 65% of all distance vision impairment, 82% of all blindness and 50% of the population living with hearing loss. The prevalence of vision and hearing loss among the older population in the developing world is staggering, and yet much of it is preventable or treatable. Nearly three quarters of the global incidence of distance vision impairment is avoidable. Similarly, only 1 in every 7 adults in need of a hearing aid seeks to get one. There are also important social implications arising from these treatable disabilities – social isolation and withdrawal, mental health decline, job loss and lost independence.

Retinal damage increases with age.



Presentation by Brien Holden, data from Brien Holden, Mingguang He, Monica Jong, Wayne Li, Brien Holden Vision Institute.

The reasons for such great unmet need are manifold. Screening services in low resource settings and rural areas are largely unavailable. Accessing proper treatment for these disabilities in these contexts is also exceedingly difficult. Physicians and specialists are in short supply, as are diagnostic instruments and commodities – like corrective lenses and hearing devices. Even when services and commodities are available, affordability is also a critical issue. Treatments and assistive devices can be expensive investments for a household. Frequently replacing batteries, repairing broken eyeglasses and other maintenance only adds to the cost and accessibility concerns. It is also not uncommon for individuals to reject a hearing or vision solution, based on appearance or fit, so this often requires more nimble solutions that can meet a range of people's needs.

However, innovative solutions to solve these issues systematically, and with the potential to do so at scale are already entering LMIC markets. Presentations at the Global Forum highlighted social enterprises and public–private partnerships with innovative approaches to increasing

access, affordability, acceptability and sustainability of interventions dealing with sensory impairments. As with many accessibility issues, accessing screening and treatment services in low resource settings is largely a function of the availability of trained personnel and health infrastructure. This is particularly a problem for the rural-based older populations of the developing world. Physicians and health professionals are often scarce in rural areas, and infrastructure is often considered an inefficient allocation of resources for relatively sparsely populated areas.

Smartphone “hearing aid” (left) and REAT Institute model hearing aid (right).



Presentation (left) by Modesta Nyirenda, Solar Ear; (right) Orajitt Burmungskulswat National Health Security Office of Thailand.

However, recent innovations adapting current technologies have shown they can greatly improve the reach of the existing infrastructure and doctors. Rural outreach teams can be based in cities and areas where doctors would prefer to live, and use a hub-and-spoke model to reach more remotely based patients. An even more efficient approach uses m-Health technology.⁶ Technicians do preliminary screening and treatment, and can connect the patient via a mobile videoconference to consult with a doctor when necessary. Using this model, these innovators found they could manage 90% of cases on site, without the need to refer the patient to an urban-based doctor. Similarly, easy to use smartphone applications have been designed to test hearing remotely, and can transmit results to doctors without needing to deploy highly trained personnel to the field.

These innovators have also changed the economics of delivering vision and hearing care to low resource settings. Cost reductions and efficiencies discovered in the delivery of vision commodities and even surgery have enabled these innovators to make services more affordable. Importantly, charging full market price for services and commodities to those who can afford to pay, allows these enterprises to make a profit. The profit margins

⁶ The WHO Global Observatory for e-Health defines m-Health as “medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices”.

from higher income patients are significant enough to sustain and grow the business, while enabling them to use surplus revenues as appropriate to subsidize care for those who cannot afford it. Emerging technologies presented by these innovators at the Global Forum will also bring the cost curve down. A low-cost eye imaging device developed and presented by one of the innovators can quickly and remotely transmit data to doctors for diagnosis. Rechargeable hearing aids powered by solar-rechargeable batteries, and produced locally in LMICs are effective and affordable. These have the ability to recharge for free and do not require access to electrical infrastructure. A device that creates a custom-moulded earpiece for a hearing aid in minutes can make hearing aids more effective and acceptable, while also driving down cost. Lastly, a new generation of hearing devices which look more like smartphones and portable music players was presented. The more modern appearance can make assisted hearing less socially isolating and more attractive to users, while local production can keep prices low. In the longer run, more doctors and infrastructure are needed, but if current innovations can be fully brought to scale, much of the unmet need gap can be closed.

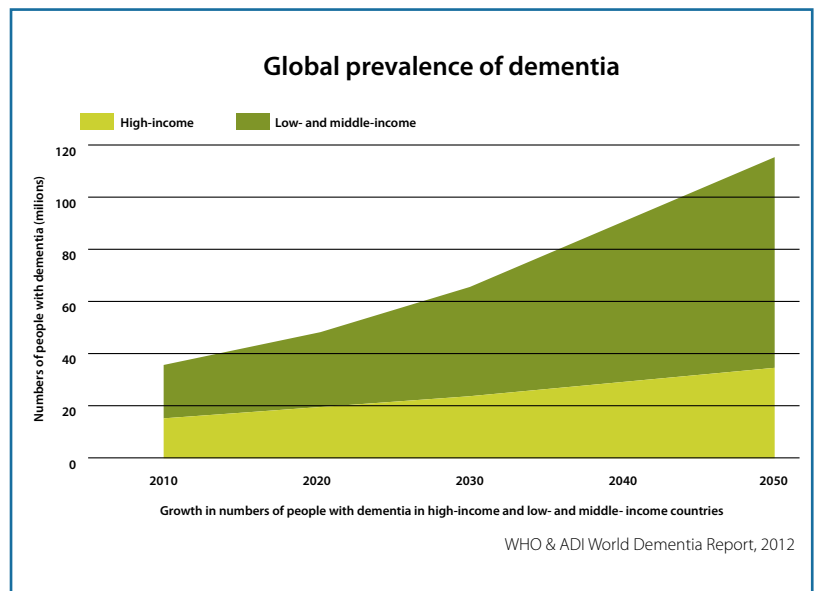
3.4 Mitigating cognitive decline

Among the NCDs, dementia may have the greatest socioeconomic impact. According to recent research, dementia affects at least 35 million people worldwide, and this number is projected to double every 20 years, yielding well over 100 million people with dementia by 2050. More than 70% of these cases will be found in current LMICs. The societal costs of dementia are significant and manifold. The economic cost of dementia worldwide was estimated at over US\$ 600 billion in 2010, about half of which is accounted for by the economic cost of informal caregiving. Cost forecasts presented at the Global Forum for 2050 show a potential 3–4 fold increase in this figure.

The growing global challenge posed by cognitive decline has provoked a sophisticated innovative response with the potential for scaling and cost-effectiveness. The first response must necessarily be to prevent the disease from taking hold for as long as possible. Research shows that as much as 50% of all dementia cases are attributable to modifiable risks. An emerging body of evidence indicates that education or cognitive training is protective against dementia. Recent declines in age-specific risk for dementia point to a new class of increasingly educated older adults. Education, including the educational attainment of one's mother, appears to be instrumental in preventing or delaying the onset of neurological decline. Evidence shows that even in older adults, cognitive training continues to be protective against neurological decline. There is also evidence that physical activity and managing cardiovascular health

are protective against dementia as we age. Although education and physical activity are familiar approaches to public health, they are highly scalable, powerful tools that pay health and societal dividends beyond the scope of dementia prevention.

58% of all people with dementia lived in LMIC in 2010, and that proportion will grow to 71% by 2050.



Presentation by Sheung-Tak Cheng, Hong Kong Institute of Education (WHO Data).

Neurological decline describes a category of diverse conditions and causes. The latest innovations in brain imaging enable physicians to observe the brain and its function in real time. This allows for more rigorous diagnoses of the neurological disorder and more precision about the affected areas of the brain. In turn, this can yield better targeted interventions, and ultimately the ability to view the effects of the intervention on the targeted area as they occur. One of the compelling innovations presented at the Global Forum combines these advanced brain imaging techniques with video games designed to treat older adults with dementia. The games showed that they could stimulate specific parts of the brain with various tasks in a gaming environment. The games could be programmed with increasing complexity as the user develops the skills needed to cope with the required tasks. The games can be designed for a range of users and conditions, and could transition to mobile devices for increased scalability and reach.

3.5 e-Health and robotics

The contemporary practice of placing elderly adults in institutionalized care has created its own industry, and it is growing quickly to meet the needs of ageing societies with few options for home-based or family care. However, most older adults would prefer to live in their own home as long as possible, and to manage their own independence and health as they choose. Ageing in place and home-based care have become rising innovation sectors, with the design of tools and systems to support older adults and their caregivers. Many of the emerging innovations in this space leverage information and communication technologies, and at the most advanced end, robotics, to enhance communication, reduce isolation, replace functional loss and otherwise support healthy independent living.



Innovations in robotics may handle certain care functions or enhance older adults' ability to live autonomously

Presentation by Zhiwei Luo, Kobe University.

Most older adults would prefer to age at home on their own terms, and e-Health technologies have the potential to play an important role in enabling them to do so. Fundamentally, e-Health for older adults is an important mechanism for communication, both for human interaction and for sending and receiving information. M-health is an important class of e-Health technology, and is discussed in more detail in the next section. With these technologies, older adults could have a video call with their physician without leaving their home. Similarly, the same capability would allow someone to connect with friends and family, and could help to prevent less mobile individuals from social isolation.

Barriers to eHealth Adoption and Use

- Lack of skill
- Concerns about security
- Quality of information
- (Perceived) complexity of internet
- Seeking information on the internet requires a range of cognitive skills

Presentation by Masahito Kawamori, Keio University.

E-Health systems can work seamlessly with standard health monitoring devices such as blood pressure cuffs or glucose meters, and can pass this information along to a physician. Pharmaceutical e-Health innovations also include devices that transmit data about taking prescribed medications and the patient's condition before and after taking their prescribed dose. E-Health devices can also be helpful for receiving information as well. A number of internet-enabled devices can deliver this functionality, but as presented at the Global Forum, the key characteristics of effective e-Health are ease of use and acceptance, security and that the information shared is credible. One way to ease the transition to these devices and improve acceptability is to nest these new functions in a device that older adults already know and understand, for example televisions. Remote-controlled displays, and other push-button controls that do not require hand strength, offer familiar means for interacting with devices and intuitive controls. As more tech-savvy adults grow older, a rising industry of tablet-based, and even game console-based e-Health technologies are emerging. Global Forum participants watched a demonstration of older adults engaging in exercise class together from their own homes, using the sensors on a game console and a high-speed internet connection.

Key Factors for eHealth Design for Older Adults

- Ease of use and simplicity
- Security
- Credible information with assured quality
- Low stress adoption and initial use
- Little training for use and maintenance
- Seamless integration into daily life

Presentation by Masahito Kawamori, Keio University.

Many older adults living at home have family caregivers as a complement to, or as a replacement for a formal caregiver, and e-Health innovations also provide a number of enabling solutions to manage the challenges of informal care. Informal or family caregiving can be extremely demanding, inducing stress, isolation, reduced mental and physical health, and lost work opportunities and productivity. These stresses on the caregiver are most acute when caring for older adults with serious chronic conditions, particularly dementia, but also with other energy and time intensive care. E-Health solutions can give caregivers internet-based coaching to help make care easier, manage expectations, and most of all, to help the caregivers to care for themselves. Connecting with other caregivers in a virtual space provides more learning opportunities as well as social support from other caregivers, reducing isolation and supporting mental health.

At the most advanced end of the e-Health spectrum is an emerging wave of robotics. As the number of older adults who need some level of assistance increases, societies may benefit from technologies that can effectively handle certain care functions, and which enhance an individual's ability to live autonomously. Innovators have developed human-like robotic nurses, capable of sensing and processing information about the patient, and possessing the strength and care needed to help a disabled older adult to sit up or move. Assistive robotic mobility devices have also been developed, which enhance but do not replace the functional abilities of the user, thus granting increased independence. Robotics can also refer to a category of e-Health that deals with devices or systems with the ability to sense or measure, and to automatically analyse that information for action. These may include sensor systems that passively collect and analyse data about a patient's health or mobility, and predict falls or other health events. Using data analytics to predict or identify health events can reduce the need for on-site caregivers and promote the autonomy of the user.

3.6 m-Health

One of the key barriers to supporting the health and independence of older adults in LMICs is relatively poor access to appropriate health information, personnel and services. This has important implications for many ageing-related health conditions, which may go undiagnosed or untreated without accessible information and services. Data presented at the Global Forum suggested that older adults in many low resource settings have poor awareness and control over NCD. Data from the aforementioned WHO SAGE studies showed that only 23–45% of hypertensive older adults were aware of their condition and only 4–14% were effectively controlling it. Sensory impairment disabilities in older adults in lower resource settings show a similar pattern. Three quarters of all distance vision impairment could have been avoided with appropriate diagnosis and treatment. Similarly, as previously noted, only 1 in 7 adults with hearing loss and in need of a hearing aid seeks to get one.

Emerging innovations supported by mobile telephony (m-Health) may offer some solutions to these problems, which could be scalable in lower resource settings. With more than 80% of the world's population using mobile phones, it is quickly becoming feasible to use mobile phones as a platform to reach many individuals without access to appropriate health information, personnel and services. As the cost of mobile phones and mobile communications has become more affordable and the network infrastructure has extended its reach into many of the poorest and most difficult to reach populations, mobile phones offer an unprecedented ability to bring almost all people closer to one another, as well as to information.

Even the simplest mobile phones can deliver health information or medication reminders to patients, their caregivers and health personnel. More sophisticated applications of these devices are being developed, so that even simple phones can become powerful tools for health.

A portable clinic pioneered and presented by an innovator at the Global Forum offers one approach to this solution. Health personnel in underserved areas equipped with a simple clinic-in-a-box, and with minimal training can administer diagnostic screening on-site and transmit data to physicians located remotely using a device connected to a mobile phone. The box offers voice or video interfacing between the patient and the physician, allowing at least a minimal level of assessment, preventive care and monitoring. Cases requiring a hospital visit can get escalated quickly. Telemedicine is becoming increasingly useful for efficiently bringing patients closer to doctors or health staff. It can deliver diagnoses and care for difficult to reach people, and save remotely-based people from having to travel to health facilities. Presentations at the Global Forum demonstrated telemedicine models for vision care, and for diagnosing hearing loss.

Mobile phones can also be used to collect and transmit data in real time for health monitoring. Even simple mobile phones can be conduits for transmitting data. More sophisticated phones may also be able to convey information about your movement, using geolocation or the accelerometer in smart devices. A presentation at the Global Forum suggested that these devices can help track dementia patients who may have become lost from their home or care facility. These phones may track and analyse the gait of people at risk of falls, or detect a fall when it has happened.

The applications of mobile data and communications for the health of older adults are already proliferating and their potential for improving access and independence for older adults in low resource settings could be substantial. However, this industry still has considerable room to develop and improve. Of the thousands of available health and medical-related mobile applications, few have been evaluated, and those that have been evaluated are of widely varying quality. There are also emerging privacy issues regarding the kinds of data collected and shared with mobile application companies, which threatens public trust in health and medical mobile applications.

3.7 Elder-friendly medicines

Research presented at the Global Forum indicates that the number of medications needed to sustain health in older adults increases almost linearly with time. In other words, the older people become, the more medication they need. Pharmaceutical treatment requires precision, and 50% of older adults make errors in the size or timing of their dose, which can lead to



Elder friendly medicines: Innovative formulation concepts can make it easier to take medications

Presentation by Kiyomi Sadamoto, Yokohama College of Pharmacy.

catastrophic results. Diminished dexterity can make it impossible to access medication from pill containers, yet elder-friendly containers and boxes are also inherently dangerous in the presence of children. Visual impairment can make it difficult to read the proper dosing, or distinguish between color-coded or size- and shape-differentiated pills. Memory-impaired patients may not remember to take medications, or that they have already been taken. Moreover, our bodies' response to medicines changes as we age, developing heightened sensitivity to many medications. However, while our older bodies also become more vulnerable to infection, we lose our effective response to vaccination. Needless to say, the need for pharmaceuticals becomes increasingly important as we age, but the challenges in ensuring the complete efficacy of these treatments also become more complex.

Risk Factors for Medical Non-Adherence

- **Cognition:** memory of what to take, when, where, and how
- **Reach:** mobility, frailty, arthritis impair access to medication
- **Vision:** vision impairment may limit ability to differentiate between medications, follow instructions
- **Open:** diminished manual dexterity, musculoskeletal factors impair access to medication
- **Swallow:** taste, sialorrhea, xerostomia, dysphagia make it challenging to swallow medications
- **Pay:** financial limitations may prevent acquisition or access to treatment

Presentation by Michael Theodorakis, Oxford University

Innovations in the pipeline of medicines have the promise to respond to many of the identified needs of older adults, reduce hospitalizations, improve health and well-being, and strengthen independence. The global ageing phenomenon is an opportunity as much as it is a challenge for this industry and has provoked a number of innovations beyond the scope of specific disease responses. Important innovations in this field have emerged to improve medical adherence. Unit-dose packaging was one of the early leading innovations in this space. More recently, developers of m- and e-Health technologies have begun to explore the potential of data-enabled platforms for medicine. Mobile phones and networked

devices can channel reminders for the timing and proper dosage of medicines. Networked devices can also communicate with physicians about what was taken and when, either actively, if the user is prompted to do so with a reminder, or passively with new sensor technology built into prescription containers. Similarly, nanotechnologies have advanced to the point where nano-devices can be embedded in pills, and can, among other things, passively signal to the physician that a pill has been ingested.

Innovative formulation concepts may also have game-changing results for the health of older adults. Scientists have begun testing the polypill concept, a new approach to mitigating the user-compliance risks of polypharmacy. Polypill formulations are a composite of multiple medications in a single pill. The intuition behind the polypill is compelling – with only one pill to take, there is a reduced risk of improper dosing, and reduced confusion over choosing which pills to take and when. Further innovation with these types of formulations is needed in order to adjust dosing to the patient. Innovations are already underway for making this and other large- or mixed-dose medications easier for patients to take. Gel packs can now serve as the delivery mechanism for multiple medications, all in a single dose. Pre-packed gels preclude patient decision-making about which pills to take or in what dose-size. They are also significantly easier to swallow than pills with water, which is particularly important for older patients with swallowing difficulty or who cannot take pills with water.

Several recent innovations may boost our immune response to vaccines, making them more effective even as our bodies' natural response to vaccination diminishes with age. Researchers are experimenting with adjuvants – compounds or organic material which, when paired with the vaccine antigen can provoke a stronger immune response by the body. Many other innovations may prove effective against immune senescence, and with far less engineering. For example, the part of the body that the clinician administers the injection to may also influence the immune response. The dermis and the epidermis appear to have more cells responsive to the vaccine agent than our muscles, or subcutaneous tissues. Not only could this intradermal vaccination help to boost the immune system response in older adults, but it could also end up requiring smaller doses. New thinking on vaccinations also suggests that older adults should be vaccinated with long-acting vaccines at ages before the immune system begins its decline. In other words, the timing of the vaccination may determine how protective it can be.

3.8 Social innovation for ageing and health

As we discuss new data, technologies and devices to improve the health and welfare of older adults, it is far too easy to lose the human dimension of the conversation. Our relationships and our capacity to give and care for one

another could be a critical innovation sector to enable health and autonomy for older people. There are perhaps many labels for this kind of social innovation, but at its core it values older people as instrumental in their own successful ageing. Older adults have a great deal to offer their communities, and there are compelling reasons to believe that enabling older adults to contribute and exchange with their community could improve health outcomes. The evidence presented at the Global Forum points unequivocally to mental and physical engagement stimulating the brain and building the physical tools to prevent decline. Furthermore, the social innovation sector offers new tools to prevent isolation and institutionalization, both of which have unambiguously negative health and well-being outcomes.

One of the central tenets of social innovation is the concept of mutuality, or reciprocity. In the Ryukyu Islands in Japan, support programmes bring students from throughout the country to stay with older adults during the breaks from their schooling. In exchange for some assistance from the younger generation, the older generation teaches the students traditional culture, history and scarce skills. Aside from that which was directly exchanged, the relationship helps to break the social barriers between young and old, counters chronic isolation, gives the elderly a heightened sense of self-worth, and preserves precious traditions that are often lost between generations. Parallel efforts integrate the elderly into community development projects and teaching in local schools, where their knowledge and skills are greatly valued. Finally, the community mobilizes stay-at-home younger adults to give limited homecare support to older members of the community who may need a little help but want to avoid an institutional home facility. Similarly, experiments in the United Kingdom have worked to develop models where young people invest their time as volunteer carers for older people, under the understanding that they could retrieve their investment when they reach older age in the form of voluntary aid. Networks of older people have also been established to promote mutual support.

Several important themes stand out from these examples of social innovation. First, many people are willing to help one another without commercializing the assistance. Second, while people can be altruistic, pure altruism is not sustainable. People respond to incentives – they are much more willing to support someone else when they receive something in return. Third, there are underutilized assets in the community – older adults in particular have significant underutilized value, but similarly there are other sources of support that need not be bought. Social innovation could potentially be a low-cost, low-risk, high-value mechanism, particularly in low resource settings where formal, commercial markets for support may be cost-prohibitive.

3.9 Tools for decision-making

Decision-makers around the world are challenged with making difficult decisions about how to achieve the best possible health outcomes with available resources. As innovations emerge to improve the health of older adults, decision-makers need to be able to make informed decisions based on the available evidence on safety, quality, efficacy and value. Presenters in the Global Forum noted that the first step must be to determine what older adults need as well as what they want, for their health and daily life, even before an innovation should be considered. Participants presented innovations that support older adults to discover their needs and preferences, as well as innovations to give a voice to these needs in decision-making. These are important inputs that should contribute to considerations about what types of innovations may be needed, as well as how to evaluate outcomes for these individuals. However, more of this type of data is needed, particularly in newly ageing societies in which less may be known about the health status and lives of older adults.

In order to support decision-makers in evaluating emerging technologies, innovators have developed methodologies to conduct systematic evaluations of health technologies. Health technology assessments (HTA) evaluate technologies with a multidisciplinary approach to include quality, safety, effectiveness and value for money, among other dimensions. As presented at the Global Forum, HTA enables decision-makers to compare technologies using common metrics, including cost and health outcomes. HTA in practice may still need further development, however. Participants noted that HTA is not as effective in evaluating technologies through the lens of social values, which are certainly important to the outcome and may also factor into political thinking. HTA may also favour a technology with lower cost per quality-adjusted life year over a technology with a better, but less cost-efficient outcome. This may prove to be better for the decision-maker at the societal level, but may be less desirable for the patient.

Regulatory authorities also play an important complementary role in the adoption of health innovations. Regulators are tasked with ensuring the safety of technologies, while also optimizing the performance of health innovations. The pressure to quickly approve new, potentially impactful health innovations further complicates the challenge of this role. Innovators operating on an international scale must then navigate the various regulatory systems where they choose to operate, which may cause delays in access and uptake. Presenters proposed that international harmonization of regulations would help to smooth the process and encourage international adoption of proven technologies. It was also noted that harmonization of regulations can help to reduce costs of innovations entering new markets.

Chapter 4 – Considerations for design of new innovations

The Global Forum revealed a dynamic community of innovators, working to engineer and design solutions to the diverse health and social challenges of ageing. However, as we have seen, the greatest challenges are yet to manifest themselves. In the near future, a wave of over 1.6 billion older individuals living in lower resource environments will emerge, requiring scalable health solutions. Lower resource environments demand solutions that are more affordable and accessible than ever before. Finally, solutions must be designed to be appropriate and acceptable for the ways in which older adults, in diverse environments, live their lives. This is a truism of product or system design, but it is particularly crucial when considering transferring or scaling innovations across borders in unfamiliar markets and homes.

Much of the necessary innovation lies ahead. One of the stated goals of the Global Forum was to share and learn from stakeholders and thought leaders across the spectrum of innovation and health, so that the next generation of innovations for healthy ageing will meet the needs of an emerging cohort of older adults. Towards this goal, discussions throughout the Global Forum were designed to focus on learning from a wide range of innovation. These discussions produced a series of design principles, grounded in lessons learned from current innovations, as well as forward-thinking based on evidence and what we know about the challenges ahead.

4.1. Changing economies

Designing innovative health and other products of everyday living targeted at older adults requires a deep understanding of this complex and diverse demographic. The globalization of ageing has clearly diversified this demographic along sociocultural lines, but even within societies there is a great range of older adults with varying preferences and needs. The older adult market segment may include people as young as 50, and those up to 100 and beyond, and young-old and old-old definitions may not sufficiently segment this wide-ranging age group. It has already been argued that even people of the same chronological age can have diverse health profiles and living needs.

Sometimes referred to as the “Silver Economy”, the financial realities and economic role of older people are also increasingly diverse. Savings behaviours and instruments have changed, and without significant asset-accumulation heading into older age, older adults cannot be assumed to be relatively wealthy. It also cannot be assumed that older adults are necessarily retired from the workforce. The Silver Economy also includes growing numbers of older adults who continue to work. Ageing in LMICs further diversifies the financial profile of older consumers. This should underscore the need for innovations to be both frugal and of high quality, so that they will be affordable and valuable for the range of adults in this market.

Global Forum presentations argued that older adults are sophisticated, experienced consumers with strong preferences. Innovators face the difficult challenge of designing products that balance sufficiently high performance with ease of use and affordability. Older users tend to prefer products that require less training, and which integrate well with their existing daily life. These kinds of requirements are particularly important for high-technology solutions. Many technologies for the Silver Economy are often adapted from existing technologies, rather than innovations designed specifically for older users.

4.2 Multimodal solutions

As we work to develop innovative solutions to solve health and social problems, it is easy to fall into the trap of looking for silver bullets. Undoubtedly, we can point to a multitude of solutions that have solved serious problems with a single disruptive technology. However, most ageing-related health challenges are considerably more complex, and often resistant to single mechanism solutions. The challenge is further deepened by the incidence of comorbidities in older adults, where one individual may suffer from multiple health conditions simultaneously. In order to successfully mitigate or disrupt the persistence of complex health conditions, innovations should be nested in a concerted, multimodal strategy to affect the desired health outcome. Wielding different tools and different approaches to solve the many facets of complicated health problems is essential for creating durable solutions.

4.3 Interoperability

One area of potential inefficiency that may emerge with increasing innovation would occur when various technologies fail to operate well with one another, or with the other tools of everyday life. For example, many modern technologies have proprietary parts or coding that may only work well with devices or software designed by the same company. Innovations that may be affordable by themselves may prove to be expensive or otherwise cumbersome if they are not interoperable with the other technologies or parts needed by the user. This is a particularly undesirable problem in resource-constrained environments. At the highest levels, one solution is to set industry standards for interoperability, as presented at the Global Forum.

4.4 South–South innovations

With a population of more than 1.6 billion older adults projected to live in LMICs, a key to innovating for these populations may be to cultivate and catalyse solutions by innovators in the Global South. In recent years, entrepreneurs from LMICs have shown great ability to invent, commercialize and scale solutions to health and social problems. Several innovations presented

at the Global Forum demonstrated how powerful South–South innovation can be. Using only locally available parts, and local engineering expertise, ensures that technologies are repairable and replaceable, which is critical for assistive devices and other relatively large investments for a user or their family. Southern innovation is often inherently frugal to produce, using cheaper factors of production and economizing on the cost of transport. It also has the benefit of adding employment, which may include older adults themselves, and builds indigenous expertise. Perhaps most important of all, local innovators are better positioned to understand the health and social problems that people in their community face, and to design solutions that will be acceptable and work well in these diverse contexts.

4.5 Co-created innovation

One of the most powerful secrets for innovating solutions for ageing populations is hiding in plain sight. Older adults themselves are the keepers of important data about preferences, requirements and other usability and acceptability parameters for innovations. They are also a key source of innovative ideas themselves. Experts at the Global Forum agreed that to be successful, innovations need to be co-created with older adults. Involving older people in the innovation process not only gives people agency over the technologies and systems that will affect their lives, but it also ensures better alignment with their preferences, and thus greater acceptability.

4.6 Universal design

Designing innovations to improve the health and welfare of older adults may, in fact, imply designing innovations that improve the lives of everyone, together. From the beginning, one of the key guiding principles of the Global Forum was to encourage innovations that reduce isolation and strengthen independence. Operating from this core principle, participants suggested that the concepts implied by universal design may be instructive. The disability community has long advocated for innovations designed for people, with or without disabilities. Innovations can be designed to be age-free – accessible, desirable and useful for people regardless of their age. Examples of age-neutral products included new car designs with a style that appealed to younger users, as well as functions that would appeal to older users, such as seats that adapt to users who have difficulty entering and exiting a car. Other emerging innovations presented at the Global Forum are transgenerational. They are not only age-free in appeal, but may also be valuable in the way they connect older generations to younger generations. Designing products, systems and environments for age may in fact promote isolation, by erecting artificial barriers between this demographic and the rest of the community.

4.7 Affective design

As innovators strive for increasingly efficient and efficacious innovations for the health and welfare of older adults, it is also important to consider the user's experience. Presenters at the Global Forum argued that the ways in which these innovations connect with users, their values, experiences and emotions are instrumental features for any innovation to ensure appeal and continued use. Innovations cannot just rely on need, users should want to have them and use them. Feelings of satisfaction, comfort, confidence, security and pride are among many important core emotions for the user, which can be triggered by the user's experience. The ways in which the user experiences the innovation may be culturally rooted, or may be personal, but they are also quantifiable – which implies that they can be optimized along with efficacy and efficiency of innovations.

Chapter 5 – Moving forward

5.1 Conclusions

The Global Forum effectively created a platform to share information, debate and drive new thinking about the current and emerging health and social challenges for ageing populations in low resource settings, and about developing, adapting and empowering innovations to meet these challenges. The challenges are significant, in both scale and severity. There is also a global community of innovators working to make older adults healthier and more independent. They are developing everything from cutting edge technologies such as robot health workers, to technology-free, simple methods for diagnosing neurological decline in low resource settings.

These accomplishments notwithstanding, much work remains to be done. Few innovations have been designed specifically for this target demographic, just as few are uniformly affordable, accessible, acceptable or sustainable in these contexts. However, innovations presented in the Global Forum demonstrated that these ambitious requirements are attainable. The aim of the Global Forum is to support these first waves of innovation, and where possible, to enable new innovations to enter the pipeline. In discussions at the first Global Forum, and in the feedback received, stakeholders articulated that these kinds of opportunities are greatly needed. Moving forward, WHO will continue to facilitate access to the most up-to-date demographic, health and economic evidence for innovators, implementers and policy-makers, while also closing the feedback loop so that these consumers of data can feed back to researchers the perceived data needs and gaps in the science. WHO will network known stakeholders as well as unconventional partners in new ways, in order to identify synergies and opportunities across different sectors and the public–private divide.

The time in between subsequent meetings of the Global Forum presents a valuable opportunity for WHO and its partners to fill in the evidence gaps and to build tools and other infrastructure necessary to catalyse innovation. It will be important to identify and fill research gaps using the resources and scientific activity of WHO and its global partners. Addressing the gaps in knowledge about moving innovation from seed to market, and mitigating bottlenecks along that path are also a priority. This will also be an important opportunity to synthesize current evidence into actionable products that get ageing and innovative solutions squarely on the agenda of influential players in health and development. In this way, smaller investments of resources can be leveraged to greater effect, and can marshal resources more commensurate with the scale and severity of the challenges ahead.

5.2 Identifying and investigating the gaps

Empirical evidence and data are instrumental to understanding health and societal challenges, the design of innovative solutions, and effective decision-making. At the Global Forum, participants engaged with evidence from a wide range of sectors concerning the health and welfare of older adults in LMICs. When woven together, this data conveys a number of very important findings about global ageing. First, that LMICs will soon have large populations of older adults, and will face the double burden of infectious and parasitic disease as well as NCD at large scale. Second, evidence points to a widening gap between life expectancy and healthy life expectancy, due at least in part to lengthening of human life, while the burden of disease and disability is growing and affecting people at younger ages. Many of these disabilities and morbidities are often preventable or at least can be delayed by access to preventive care, which strongly advocates for universal health coverage, a life course approach to health, and education. The impacts of ageing on health systems financing and the greater economy of these societies can be structurally disruptive in terms of the adjustments required to meet changing needs, but are far from cataclysmic or unalterable. Importantly, we have also seen that innovations can intervene and have an impact on the trajectory of ageing for the individual, their caregivers and society.

Barriers to Effective Evaluation of Tech-Enabled Programs

- Lack of Resources
- Digital Divide
- Limited technology uptake and acceptability
- Rapid change in technology
- Lack of interoperability
- Privacy concerns
- Limitations of traditional evaluation designs and methods: measures, just-in-time, analytics

Presentation by David Lindeman, University of California, Berkeley

Significant research is still urgently needed to guide and support new solutions from seed to scale. We need to continue to develop evidence around the need for innovative solutions. In the realm of data, this includes continuing to strengthen our understanding of disease and disability among older adults in the developing world, but also the ways that older adults live their lives and interact with health care providers. This information will determine what and how solutions might work. Ethnographic studies would provide insight, and when paired with health and demographic surveillance data may help to fill gaps in the picture. It would also

be of great value to dive deeper into the experience of ageing individuals in lower resource settings within both urban and rural geographies. Finally, the Global Forum has called attention to the need to re-evaluate how ageing, and older people are defined. Individuals from LMICs age biologically and functionally in ways that are not well represented by their chronological age and their counterparts in higher income countries. This is clearly an important area of further inquiry for the scientific study of ageing populations and their health, and the implications for the data and analysis could be profound.

There is considerable need to expand the body of research on evaluations of these interventions for health outcomes. Innovations lie at the cutting edge of ideas, technologies and methods, but the empirical relationship between these solutions, and the desired health or social outcome remains broadly untested. Real impact assessment is necessary for decision-makers of all kinds – policy-makers and regulators, all the way down to families. This is a particular concern for decision-makers of relatively lower means, where even frugal innovations represent relatively significant investments with considerable risk. It would also be valuable to invest in some synthesis work, which would take stock of the body of evidence on what has been evaluated, what works, and perhaps just as importantly what does not work.

5.3 Encouraging partnership and the role of WHO

WHO and its Centre for Health Development in Kobe, Japan, seek to play a catalytic role in enabling the design, deployment and scaling of impactful innovations for healthy ageing. The role of WHO begins with scientific leadership and knowledge generation. WHO plays a leading role in synthesizing evidence about ageing populations in the developing world. It is also well-positioned to shape a research agenda for innovation for healthy ageing, by identifying gaps in the data and the science, motivating scientific inquiry, and developing evidence-based guidance, where appropriate.

One of the most powerful ways in which WHO can play a catalytic role will be to leverage its convening and networking power, to promote sharing, learning and partnership between wide-ranging stakeholders across this space. The Global Forum clearly demonstrated that there is a great deal of untapped value that can be realized by enabling active engagement and knowledge sharing in this community. The results were new partnerships, as well as ideas challenged and shared. Based on feedback from participants, more is needed, and the job is far from done. WHO will work to expand and improve the number of opportunities and channels for this growing community to continue to challenge one another, share ideas, partner and innovate together.

Annex 1– Annotated Agenda

Overview

The Forum is organized by the **WHO Centre for Health Development (WHO KOBE Centre)** and will serve as a platform for discussion and exchange between diverse stakeholders who share an interest in the health and welfare of ageing populations, with the goal of enabling frugal innovation to meet the emerging needs of older people. The emphasis of the Forum will be on low and middle income countries as they are experiencing the greatest growth of ageing populations. However, the Forum is relevant to all populations.

Ensuring that rapidly ageing populations remain healthy, productive and independent for as long as possible, requires innovations that meet the greatest needs, and which are safe, effective, affordable, appropriate, accessible and available, and acceptable to the user.

Forum Objectives

The Forum will take place over three days. The Objectives are to:

- Exchange information, views, and lessons from key operations and health systems research concerning technological and social innovations for ageing populations
- Highlight findings and solutions through specific examples of successful, scaled-up innovations
- Identify key future priorities for WHO and for partners in support of innovations for ageing populations

Stakeholders will be able to share specific perspectives including:

- **Policy makers/government:** *context-specific needs for ageing populations; effective and appropriate innovations and approaches to address the requirements of their ageing population; policy development and barriers to encourage greater innovation, coverage and access; and to reduce healthcare costs*
- **Research Community/Innovators:** *innovation trends and experience; how to advance innovations including, for example, adaptations to meet context specific ageing population requirements and needs*
- **Healthcare workers/service delivery providers:** *their needs and constraints to support ageing populations; how to promote discussion and uptake of appropriate technologies and solutions to enable the ageing population to remain healthy, active and independent longer*
- **Producers of health technologies:** *specific health needs and challenges of ageing populations in low resource environments (including LMICs); lessons and perspectives, and information needs, on strategies for increasing use of innovations.*
- **Advocates/Patients:** *articulating the needs of ageing populations from different country contexts and socio-economic backgrounds; support requirements for any technology; and how to increase greater acceptability and use of any intervention.*

The Forum Programme is shown in detail in the following pages.

Day-1: Tuesday, 10 December 2013

PARALLEL INNOVATION SYMPOSIA AND OPENING KEYNOTES

Venue: Kobe International Conference Centre (KICC)

SYMPOSIA ON INNOVATIONS FOR AGEING POPULATIONS (PARALLEL SESSIONS)

Prevent functional decline, maintain independence, and reduce institutionalisation.

The parallel symposia will enable participants to exchange information and views, and lessons from research and development for different innovations that aim to ensure ageing populations remain healthy, productive and independent. Examples will highlight actual research for different health technologies during various periods of older life, and transitions from wellness to end of life. Emphasis is on the needs of low resource environments/countries and frugal innovations that meet the needs of populations in these contexts. Such innovations need to be safe, effective, affordable, acceptable, and available.

Symposium 1: Psychomotor and functional health assistance technologies

Assistive technologies to promote wellness, independence and mobility, including care at home.

Highlights:

- Home based technologies to prevent falls
- Affordable mobility devices (wheelchairs and other mobility devices)
- Vision technologies
- Affordable hearing aids and fitting

Chair: David Lindeman (University of California, Berkeley, USA)

10:00 to 12:30 – Fall Prevention and Mobility

- Mario Bollini (Global Research Innovation and Technology, USA):
The Freedom Chair – Stakeholder driven product design in the developing world
- Hyuntae Park (National Center for Geriatrics and Gerontology, Japan):
Steps to aging well – Home and community-based technologies for older adults
- Stephanie Bridenbaugh (University Center for Medicine of Aging Basel, Switzerland):
The role of quantitative gait analysis for fall prevention in older adults
- Lawrence Normie (GeronTech – The Israeli Center for Technology & Aging, Israel): Technological interventions for fall detection, prediction, and prevention

13:30 to 16:00 – Sensory Impairment

- Ravilla Thulasiraj (Aravind Eye Care System, India): Universal eye care
- Brien Holden (Brien Holden Vision Institute, Australia):
Managing critical challenges in vision impairment due to ageing and refractive error – The role of technology
- Modesta Nyirenda (SolarEar, Botswana):
The solar ear – Providing affordable assistive hearing devices using appropriate technology
- Wachara Riewpaiboon (Health System Research Institute, Thailand):
Technological friendly hearing aids – to prevent social separation of elderly
- Orajitt Bumrungskulswat (National Health Security Office, Thailand):
Thai hearing aids service provision under the universal health coverage system in Thailand
- Ivo Kocur (Prevention of Blindness and Deafness, WHO) – Panellist

Symposium 2: Functional and cognitive decline prevention

Medical technologies targeted to prevent functional and cognitive decline.

Highlights:

- R&D for vaccines for the elderly: opportunities and barriers
- Managing chronic disease medication (e.g. managing poly-pharmacy and drug interactions generating evidence for safety and efficacy of drugs in the elderly; elderly-friendly formulations; elderly-friendly packaging including reading labels and opening bottles)
- Managing poly-pharmacy
- Increasing adherence with prescriptions and appropriate usage of health technologies (e.g., better readability of notice of use for medications and technologies).
- Delaying onset of cognitive decline (e.g. use of interactive games; review of state of development of deep brain stimulation for Parkinson's and Alzheimer's therapies; Interactive games to preserve intellectual capacity in the elderly: capacity to adapt to Low Income Countries).

Chair: Kanoko Matsuyama (*Bloomberg News, Japan*)

10:00 to 12:30 – Medical Innovation to Prevent Decline

- Michael Theodorakis (University of Oxford, UK):
Packaging and formulation designed for the elderly
- Kiyomi Sadamoto (Yokohama College of Pharmacy, Japan):
Innovation for easier drug taking for the elderly
- Linda Bryant (University of Auckland, New Zealand):
The Polypill – An innovation to improve adherence? Or a solution looking for a problem
- Martin Friede (Health Systems and Innovation, WHO):
Infection, immunity and vaccine strategies for older adults

13:30 to 16:00 – Cognitive Decline Prevention

- Kenneth M. Langa (University of Michigan, USA):
The compression of cognitive morbidity and the economic cost of dementia
- Sheung-Tak Cheng (Hong Kong Institute of Education, Hong Kong, China):
A vision toward compressing morbidity and caregiving in dementia – The role of mental and physical activities
- Anne Margriet Pot (Netherlands Institute on Mental Health and Addiction, Netherlands):
ICT innovation for dementia caregivers
- Adam Gazzaley (University of California, San Francisco, USA):
Harnessing plasticity in the older brain

Symposium 3: Ageing-in-Place: Access and use in the physical and community environment

Reducing the mismatch between personal capabilities and the physical environment.

Highlights:

- Social innovations for avoiding long-term institutionalization of elderly people
- Community social inclusion models (e.g., intergenerational solidarity: role of “young-old” guardians supporting “old-old” populations)
- Home-based diagnostics with information technology-based transmission of information to health care workers (e.g. blood pressure, pulse, blood oxygen levels...)
- Ambient Assistive Living (including ICT applications, integrated housing solutions)

Chair: *Gretchen Addi (IDEO, USA)*

10:00 to 12:30 – Social Innovation

- Chapal Khasnabis (Disability and Rehabilitation, WHO): Inclusive, empowered and healthy communities
- Yutaka Takamine (University of the Ryukyus, Japan): Community based models of care and inclusive development on a small island in Okinawa – Activities of NPO Ikama Welfare Support Center
- Samir K. Sinha (Mount Sinai and the University Health Network Hospitals, Canada): Canadian Health Care Policy and Home Care Medicine
- Benson Droti (London School of Hygiene and Tropical Medicine, UK): An innovative approach to improve health and wellbeing of older persons in Uganda using EASY-Care instrument and Strength-based approach
- Sylvia Wyatt (Young Foundation, UK): Mutuality and community resilience
- Annabel Davidson Knight (Calouste Gulbenkian Foundation, UK) – Panellist

13:30 to 16:00 – mHealth and Technologies for Ageing-in-Place

- Ashir Ahmed (Grameen Communications, Bangladesh): Portable health clinic – Preventive healthcare service at your doorstep
- Francesco Barbabella (National Institute of Health and Science on Aging, Italy): The role of ICTs in supporting informal caregivers of older people
- Masahito Kawamori (Keio University, Japan): IPTV innovation for assistive living and ageing-in-place
- Zhiwei Luo (Kobe University, Japan): Health engineering for aging using robotics
- Lawrence Normie (GeronTech – The Israeli Center for Technology & Aging, Israel): Advanced non-Invasive interventions for restoring functional independence in patients with pathophysiological tremor
- Suntae Jung (Samsung Electronics, Republic of Korea) – Panellist

17:00 to 18:00 – Opening Session

Remarks by:

- Marie-Paule Kieny, Assistant Director-General, Health Systems and Innovation, WHO
- Toshizo Ido, Governor of Hyogo Prefecture, Japan
- Kazushi Yamauchi, Director of International Cooperation Office, Ministry of Health, Labour and Welfare, Japan

18:00 to 19:00 – Keynote Speech

- S. Jay Olshansky (University of Illinois at Chicago, USA): Aging, health and longevity in the 21st century
- Toshio Obi (Waseda University, Japan): ICT for health in the elderly – from global to local applications

19:10 to 20:30 – Reception

(Portopia Hotel, Room ‘Topaz’, Basement of the South Wing)

Short remarks by:

- Alex Ross, Director of the WHO Centre for Health Development (WKC), WHO
- Kazuo Kanazawa, Vice Governor, Hyogo Prefecture, Japan

Day-2: Wednesday, 11 December 2013

STRATEGIC PLANNING FOR INNOVATION

Epidemiology, Economics, Enabling Policy Environment

09:30 to 10:00 – Introduction

- Shin Young-Soo, Regional Director, WHO Regional Office for the Western Pacific
- Video address
- Alex Ross, Director of the WHO Centre for Health Development – WHO Kobe Centre (WKC)
- General Chair Introduction

10:15 to 12:15 – **Session 1:** *Ageing: The solid facts – what do we know?*

Information and perspectives on ageing transitions (epidemiological, chronic disease risk factors, nutritional status) around the world comparing and contrasting high and low and middle income countries.

Chair: *S. Jay Olshansky (University of Illinois at Chicago, USA)*

Speakers:

- Somnath Chatterji (Department of Health Statistics and Information Systems, WHO):
The Burden of Disease in Older Adults
- Yasuhiko Saito (Nihon University, Japan):
Health status of high income ageing countries – What we know and what we don't know
- Paul Kowal (University of Newcastle, Australia):
Population health and burden of disease in older adults in middle-and low-income countries

Panel discussants:

- Richard Biritwum (Ghana Medical School, Ghana)
- Fan Wu (Shanghai Municipal Center for Disease Control, China)
- Arokiasamy Perianayagam (International Institute for Population Sciences, India)
- Amit Prasad (WHO Kobe Centre)

Plenary Discussion

13:30 to 15:30 – **Session 2:** *Ageing: Economic opportunity and the impact of needed interventions.*

Research findings and reviews of data on economic cost related to ageing populations as they relate to different age groupings and health care interventions.

Chair: *Atsushi Seike (Keio University, Japan)*

Speakers:

- Philip B. O'Keefe (World Bank, Australia):
Economics of ageing and the health sector
- Duk Sunwoo (Korean Institute for Health and Social Affairs, Republic of Korea):
Economic costs and opportunities for ageing and healthcare
- Ajay Mahal (Monash University, Australia):
Ageing and its implications for health spending in India

Panel discussants:

- John Beard (Department of Ageing & Life Course, WHO)
- Tamas Bown (Swiss Re, Japan)
- Jon Cylus (European Observatory on Health Systems and Policies and LSE Health, UK)
- Yuki Murakami (OECD, France)

Plenary Discussion

15:45 to 17:15 – Session 3: Ageing: Policies and system needs.

Review of existing ageing policies, challenges and successes, and lessons for countries that still lack such policies.

Chair: Kazushi Yamauchi (*Ministry of Health, Labour and Welfare, Japan*)

Speakers:

- John Beard (Department of Ageing & Life Course, WHO): Ageing – Innovation in policy
- Luis Miguel F. Gutierrez Robledo (National Institute of Geriatrics, Mexico): Ageing and health policy in Mexico

Panel discussants:

- Jorge Pinto Antunes (European Commission, Belgium)
- Anne Connolly (Ageing Well Network, Ireland)
- Abu Girma Moges (University of Tsukuba, Japan)
- Samir K. Sinha (Ontario Province Seniors Strategy, Canada)

Plenary Discussion**17:15 to 17:30 – Chair synthesis: Linking the ‘solid facts’ about ageing to the need for innovation.****Speaker:**

- Alex Ross (WHO Kobe Centre)

17:30 to 18:30 – “Getting to Know You” Hour

An interactive session conducive to informal networking and ideas sharing featuring:

- Anne Connolly (Ageing Well Network, Ireland)
- Yuki Murakami (OECD, France)
- Machiko Tomita (State University of New York at Buffalo, USA)
- Annabel Davidson Knight (Calouste Gulbenkian Foundation, UK)
- Elizabeth Ozanne (The University of Melbourne, Australia)
- Etsuko Ueno (Japanese Society for Rehabilitation of Persons with Disabilities, Japan)
- Wendy Babidge (Royal Australasian College of Surgeons, Australia)

Day-3: Thursday, 12 December 2013

ENABLING COLLABORATION TO CATALYZE INNOVATION

Venue: International Conference Room, KICC – 3rd Floor

08:30 to 08:35 – *Chair greeting:*

- Alex Ross (WHO Kobe Centre)

08:35 to 09:30 – **Session 4:** *Innovations for ageing populations: conclusions from Innovation Symposiums.*

Reports from the three Innovation Symposia summarizing emerging innovations; determining priorities to meet needs of populations, potential synergies across technologies and community/health systems, and enablers and challenges to future innovation.

Conclusions from the WHO-convened Consultation on medical and assistive devices for ageing populations in Asia (February 2013, Kobe), and from the 2nd WHO Global Forum on Medical Devices (November 2013, Geneva).

Chair: Fan Wu (Shanghai Municipal Center for Disease Control, China)

Speakers:

- Alex Ross (WHO Kobe Centre)
- For symposium 1: David Lindeman (University of California, Berkeley, USA)
- For symposium 2: Kanoko Matsuyama (Bloomberg News, Japan)
- For symposium 3: Gretchen Addi (IDEO, USA)

Plenary Discussion

09:30 to 11:00 – **Session 5:** *Prioritizing resource allocation.*

Decision-making parameters and issues concerning which innovations to scale up in low resource environments/countries. How best to make resource allocation decisions and how to balance ethical issues.

Chair: Jorge Pinto Antunes (European Commission, Belgium)

Speakers:

- Paul Ong (HelpAge International, UK):
Resource setting for the elderly – Hearing their voices, measuring their need
- Yot Teerawattananon (Ministry of Public Health, Thailand):
Health technology assessments for prioritising technologies for elderly
- Hongsoo Kim (Seoul National University, Republic of Korea):
Prioritizing resources for the changing needs of the health workforce in ageing societies
- David Lindeman (University of California, Berkeley, USA):
Technology-enabled care – Evaluation design to inform policy making
- Jeremy Wyatt (University of Leeds, UK):
Policy actions to improve the quality of technologies to support long term conditions – an mHealth example

Plenary Discussion

11:15 to 13:30 – Session 6: Ensuring appropriate innovative solutions, Part 1.

Moving from conception to development to practical implementation requires specific actions, research, and development strategies. Discussions of key topics to generate prioritized actions to advance innovations for ageing populations in low resource environments/countries, and priority needs.

Chair: Anne Connolly (Ageing Well Network, Ireland)

(a) Ensuring access and equity**Speakers:**

- Hiroyuki Umemuro (Tokyo Institute of Technology, Japan):
Gerontechnology and affective design – ensuring access to technologies for elderly
- Grace Chan (The Hong Kong Council of Social Service, Hong Kong, China):
Ensuring elderly participation to assess needs, improve access to health services and foster equity – the experience of Hong Kong
- Ying Liu (Intel Health & Life Sciences, China):
Building Age Friendly Nation – How ethnographic research can help?

(b) Getting products to markets**Speakers:**

- Zamane Abdul Rahman (Ministry of Health, Malaysia):
Regulatory environments to facilitate innovation and foster access to assistive and medical devices for elderly – the example of Malaysia
- Lawrence Normie (GeronTech – The Israeli Center for Technology & Aging, Israel):
Strategies to mitigate obstacles to commercial introduction and user uptake of advanced new assistive technologies
- Florian Kohlbacher (German Institute for Japanese Studies, Japan):
Silver innovation management – developing and getting products to the senior market
- Orajitt Bumrungskulswat (National Health Security Office, Thailand):
Thai Hearing Aids Service Provision under the Universal Health Coverage System in Thailand

Plenary Discussion

14:15 to 16:15 – **Session 7:** *Ensuring appropriate innovative solutions, Part 2.*

Chair: Francesco Barbabella (National Institute of Health and Science on Aging, Italy)

(a) Innovations in community based models of care

Speakers:

- Sylvia Wyatt (Young Foundation, UK):
Increasing care outside hospitals through social innovations
- Briony Dow (National Ageing Research Institute Ltd., Australia):
Staying healthy at home – from technology integration to social inclusion. Lessons learned from Ageing Well at Home with Broadband project

(b) The future of innovation for ageing populations

Speakers:

- Adam Gazzaley (University of California, San Francisco, USA):
A closed-loop approach to optimizing brain function
- Gretchen Addi (IDEO, USA):
Focusing on people first
- Carolyn Gullery (Canterbury District Health Board, New Zealand):
Developing integrated services for the elderly
- Samrit Srithamrongsawat (National Health Security Office, Thailand):
Thai long-term care strategy, universal health coverage, and technology for the elderly

Plenary Discussion

16:15 to 16:25 – **Session 8:** *Reflections on Advancing Innovation for Ageing Populations.*

Reflections on integrating the key meeting themes and looking forward

- Alex Ross (WHO Kobe Centre)

16:40 to 17:30 – **Session 9:** *Key issues for innovation – looking towards the future.*

A panel representing key stakeholders at the conference will offer two key ideas/lessons they retained from the presentations and debates. This will provide the basis for the development of a roadmap for WKC- WHO work supporting future innovation for ageing populations.

Chair: Jeremy Wyatt (University of Leeds, UK)

Panel Discussion

Panellists:

- Paul Ong (HelpAge International, UK)
- Modesta Nyirenda (SolarEar, Botswana)
- Philip K. O’Keefe (World Bank, Australia)
- Martin Friede (Health Systems and Innovation, WHO)
- Kenneth M. Langa (University of Michigan, USA)
- Samrit Srithamrongsawat (National Health Security Office, Thailand)
- Kazushi Yamauchi (Ministry of Health, Labour and Welfare, Japan)

17:30 to 17:45 – *Closing remarks*

- Kizo Hisamoto, Mayor of Kobe City, Japan
- Marie-Paule Kieny, Assistant Director-General, Health Systems and Innovation, WHO

Annex 2 – Global Forum Speakers and Participants

Mr. Zamane Abdul Rahman,

Chief Executive, Medical Device Authority,
Ministry of Health, Malaysia

Ms Gretchen Addi,

Business Lead and Associate Partner, IDEO,
United States of America

Dr. Ashir Ahmed,

Grameen Communications, Bangladesh; Associate
Professor, Department of Advanced Information
Technology, Kyushu University, Japan

Dr. Wendy Babidge,

Director of Research, Audit and Academic Surgery,
Research, Audit and Academic Surgery Division, Royal
Australasian College of Surgeons, Australia

Dr. Francesco Barbabella,

Research Fellow, Centre for Socio-Economic Research
on Aging, National Institute of Health and Science
on Aging (INRCA), Italy

Professor Richard Biritwum,

Professor, Community Health Department,
Ghana Medical School, Ghana

Mr. Mario Bollini,

Chief Technology Officer, Engineering, Global
Research Innovation and Technology (GRIT),
United States of America

Mr. Tamas Bown,

Director, Head of Life & Health Clients Markets,
Swiss Re Japan, Japan

Dr. Stephanie Bridenbaugh,

Head, Basel Mobility Center, University Center for
Medicine of Aging Basel, Felix Platter Hospital, Switzerland

Dr. Linda Bryant,

Honorary Research Fellow, General Practice and Primary
Health Care, University of Auckland, New Zealand

Ms Orajitt Bumrungskulswat,

Director, Medical Rehabilitation, Traditional Medical
and Community Health Program, National Health
Security Office, Thailand

Ms Grace Chan,

Chief Officer (Elderly Service), Service Development,
The Hong Kong Council of Social Service, Hong Kong
SAR, People's Republic of China

Professor Sheung-Tak Cheng,

Director, Center for Psychosocial Health and Aging,
Department of Psychological Studies, Hong Kong
Institute of Education, Hong Kong SAR, People's
Republic of China

Ms Anne Connolly,

Executive Director, Ageing Well Network, Ireland

Mr. Jonathan Cylus,

European Observatory on Health Systems and Policies
and LSE Health, United Kingdom

Mrs. Annabel Davidson Knight,

Programme Manager, Calouste Gulbenkian Foundation,
United Kingdom

Dr. Briony Dow,

Director, Health Promotion, National Ageing Research
Institute Ltd. (NARI), Australia

Dr. Benson Droti,

Research Degree Student, Epidemiology and Population
Health/Infectious Disease Institute, London School of
Hygiene and Tropical Medicine, United Kingdom; Medical
Research Council-Uganda, Entebbe, Uganda

Dr. Adam Gazzaley,

Associate Professor, Neurology, Psychiatry, Physiology,
University of California, San Francisco, United States
of America

Ms Carolyn Gullery,

General Manager, Planning and Funding, Canterbury District Health Board, New Zealand

Dr. Luis Miguel F. Gutierrez Robledo,

Director General, National Institute of Geriatrics, Mexico D.F., Mexico

Professor Brien Holden,

Chief Executive Officer, Brien Holden Vision Institute, Australia

Dr. Suntae Jung,

Vice President, DMC R&D Center, Samsung Electronics, Republic of Korea

Mr. Masahito Kawamori,

Project Professor, Keio University, Japan

Dr. Hongsoo Kim,

Associate Professor, Graduate School of Public Health, Seoul National University, Republic of Korea

Dr. Florian Kohlbacher,

Senior Research Fellow and Head of Business & Economics Section, German Institute for Japanese Studies, Japan

Dr. Paul Kowal,

Research Fellow, Research Centre on Gender, Health and Ageing, University of Newcastle, Australia

Dr. Kenneth M. Langa,

Professor of Medicine, Department of Internal Medicine, University of Michigan, United States of America

Dr. David Lindeman,

Director, Center for Information Technology Research in the Interests of Society (CITRIS) / Center for Technology and Aging (CTA), University of California, Berkeley, United States of America

Ms Ying Liu,

Research Scientist, User Experience, Intel Health & Life Sciences China, People's Republic of China

Professor Zhiwei Luo,

Professor, Department of Computational Science, Graduate School of System Informatics, Kobe University, Japan

Professor Ajay Mahal,

Alan and Elizabeth Finkel Chair of Global Health, School of Public Health and Preventive Medicine, Monash University, Australia

Ms Kanoko Matsuyama,

Health and Science Reporter, Bloomberg News, Japan

Dr. Abu Girma Moges,

Associate Professor of Economics, Faculty of Humanities and Social Sciences, University of Tsukuba, Japan

Ms Yuki Murakami,

Health Economist/Policy Analyst, Health Division, Directorate for Employment, Labour and Social Affairs, Organization for Economic Cooperation and Development (OECD), France

Mr. Lawrence Normie,

Executive Director, GeronTech – The Israeli Center for Technology & Aging, Israel

Ms Modesta Nyirenda,

Lead Consultant, SolarEar Botswana, Botswana

Professor Toshio Obi,

Professor, Graduate School of Asia-Pacific Studies, Director, Institute of e-Government, Waseda University, Japan

Mr. Philip B. O'Keefe,

East Asia and Pacific Regional Lead Economist for Human Development, World Bank, Australia

Dr. S. Jay Olshansky,

Professor, Epidemiology and Biostatistics, University of Illinois at Chicago, United States of America

Dr. Paul Ong,

Health Programme Policy Advisor, Policy, Influencing and Learning, HelpAge International, United Kingdom

Dr. Elizabeth Ozanne,

Associate Professor, Ageing and Long Term Care Research, Department of Social Work, School of Health Sciences, Faculty of Medicine, The University of Melbourne, Australia

Dr. Hyuntae Park,

Head, Section of Motor Function Activation, Center for Gerontology and Social Science, National Centre for Geriatrics and Gerontology, Japan

Professor Arokiasamy Perianayagam,

Professor and Head, Department of Development Studies, International Institute for Population Sciences, India

Dr. Jorge Pinto Antunes,

Senior Policy Officer, DG SANCO – Health and Consumers, European Commission, Belgium

Professor Anne Margriet Pot,

Head, Program on Aging, Netherlands Institute on Mental Health and Addiction – Trimbos Institute, The Netherlands

Dr. Wachara Riewpaiboon,

Senior Research Manager, Research Management, Health System Research Institute (HSRI), Thailand

Professor Kiyomi Sadamoto,

Professor, Department of Clinical Pharmacy, Yokohama College of Pharmacy, Japan

Professor Yasuhiko Saito,

Professor, Advanced Research Institute for the Sciences and Humanities (ARISH), Nihon University, Japan

Professor Atsushi Seike,

President, Keio University, Japan

Dr. Samir K. Sinha,

Director of Geriatrics, Mount Sinai and the University Health Network Hospitals, Canada

Dr. Samrit Srithamrongsawat,

Deputy-General, National Health Security Office, Thailand

Mr. Duk Sunwoo,

Research Fellow, Center for Ageing Policy Research, Korea Institute for Health and Social Affairs (KIHASA), Republic of Korea

Professor Yutaka Takamine,

Professor, Faculty of Law and Letters, University of the Ryukyus, Japan

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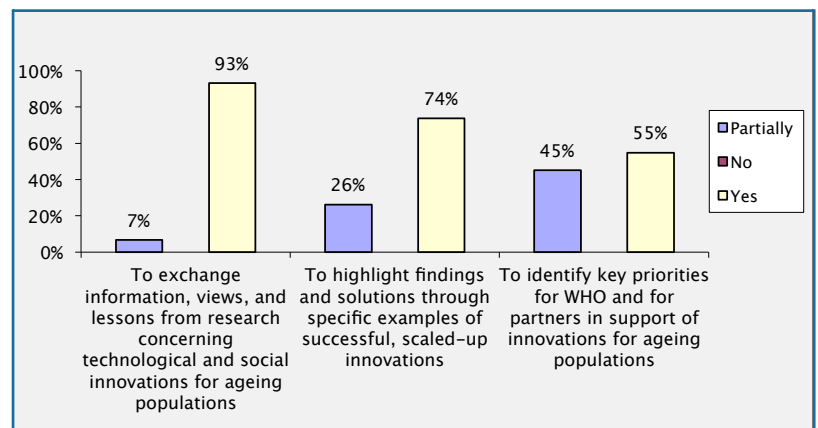
Intern, Urban Health

Annex 3 – Participant Feedback

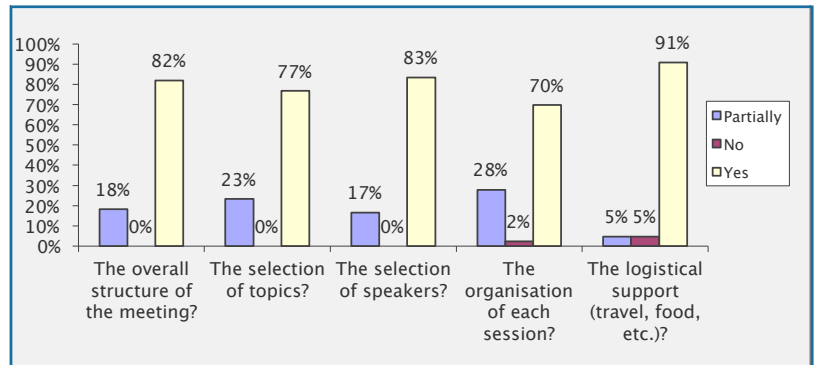
Global Forum participants had the opportunity to provide feedback on the conference, as well as to provide forward-looking suggestions to the WHO across two surveys – one paper-based survey and the other an online survey. At the conclusion of the conference, participants responded to a brief paper-based survey. The two-question, open-ended survey asked participants to reflect on key research gaps, and looking ahead, to consider priority areas for future activities. The responses about key research gaps have been summarized in the main text of this report. The second question on this survey was identical to a question on the other online survey and thus the results have been reported in combination below.

A second, more extensive online survey was sent to all participants via e-mail shortly after the conclusion of the Forum to allow them to build on their responses to the first survey, and to provide feedback on other aspects of the Forum. The results of the nine-question online survey are presented below. Participants' responses to open-ended questions in the survey were classified into generic categories for measurement. Many participants shared more than one response to the open-ended questions on this survey, and each response was therefore categorized separately, as appropriate. Thus, the total number of responses to these questions may not match the number of respondents. Question six includes the responses to an identical question on the paper-based survey, and thus represents significantly more respondents than the other questions.

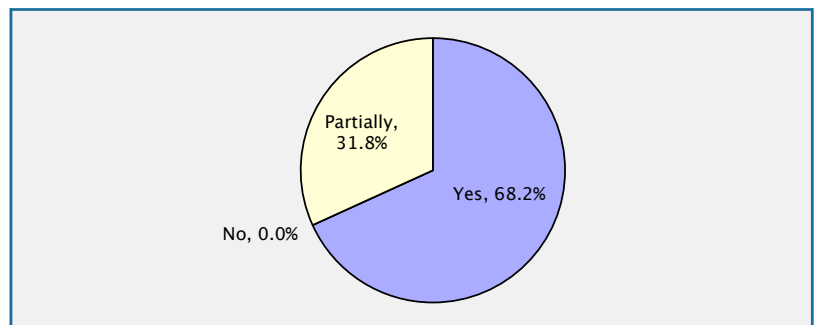
Q1: Do you think the Forum achieved each of the following objectives? (N=44)



Q2: Given the objectives of the Global Forum, are you satisfied with...? (N=44)



Q3: Did the Forum provide you with enough opportunities to network with other participants? (N=44)

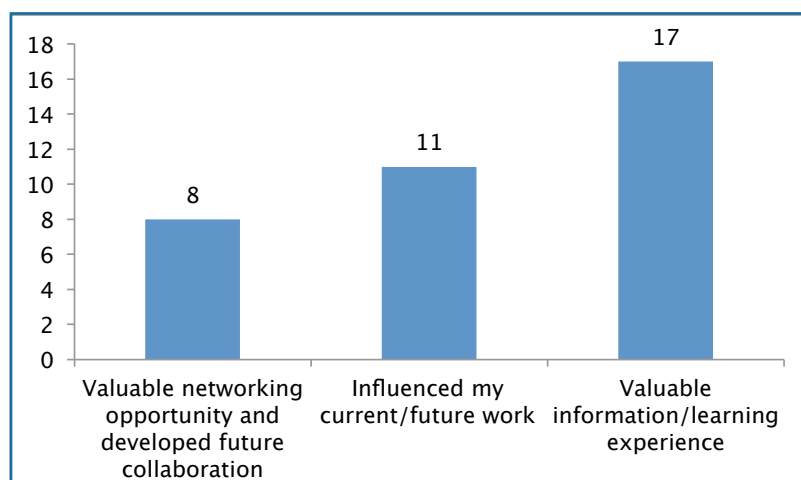


Q4: Are there any other ways we could have made your participation more successful? (N=29¹)

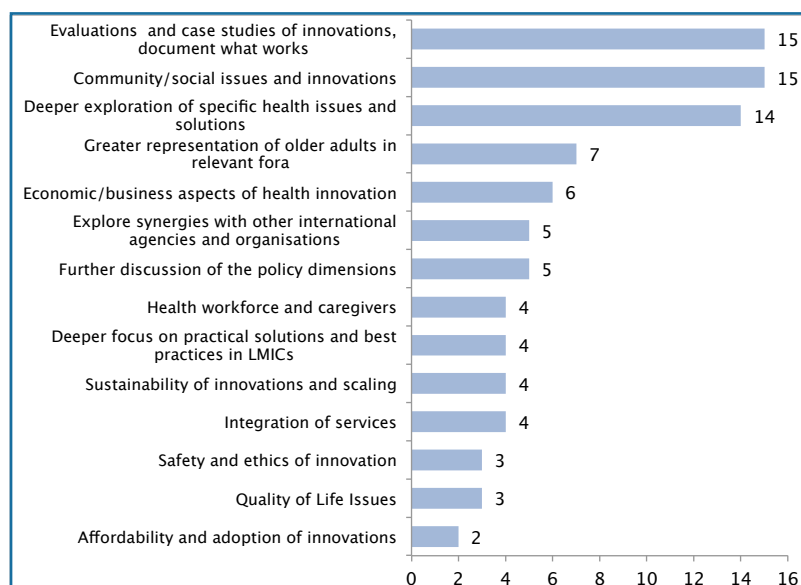


¹ Participants' responses to this question were classified into generic categories for measurement.

Q5: Please add any short reflection on your experience at the Forum, including any specific outcomes for you or your organisation. (N=34²)



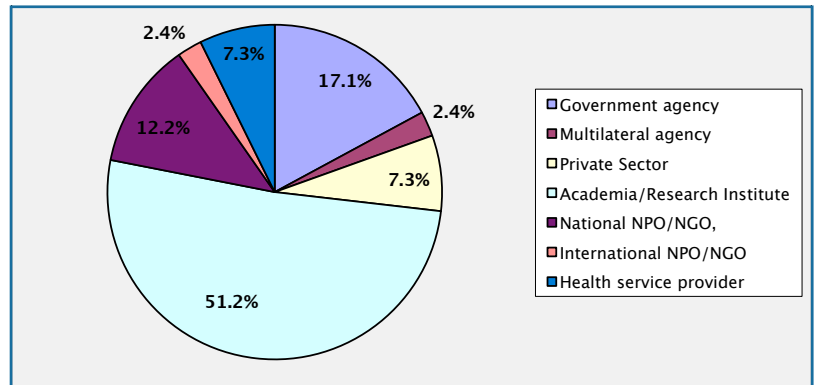
Q6: WHO is thinking ahead to the next Global Forum on Innovations for Ageing Populations. What priority issues do you feel should be considered for the next meeting? (N=77³)



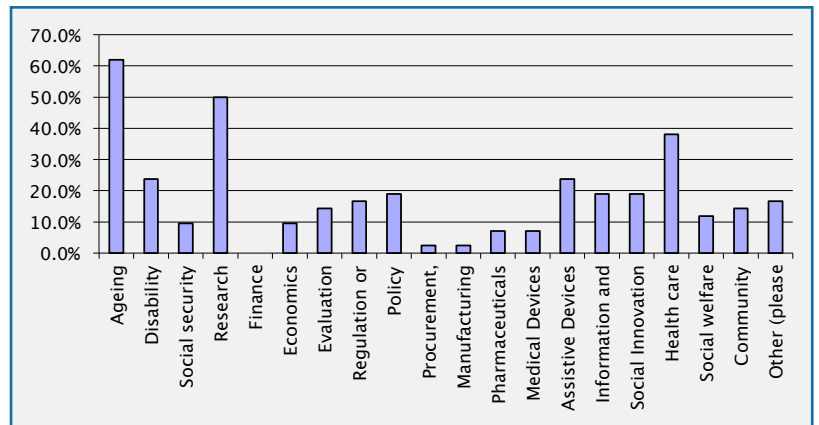
² Participants' responses to this question were classified into generic categories for measurement. Many participants shared more than one response to the open-ended questions on this survey, and each response was categorized separately, as appropriate. Thus, the total number of responses does not add up to the number of respondents.

³ This chart represents the combined responses from both the online and written surveys to the same question. Both surveys were open-ended and responses have been classified into generic categories as above. Where participants shared multiple ideas in one response, each response was categorized separately, as appropriate.

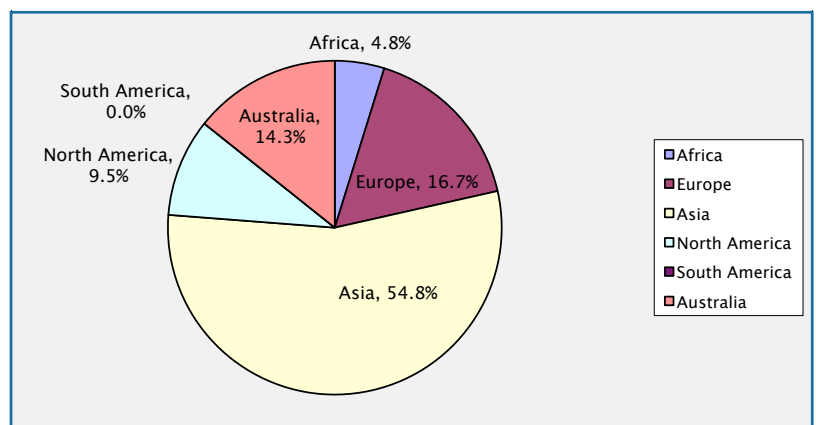
Q7: Participants' Primary Employment (N=41)



Q8: Participants' Areas of Expertise (N=42)



Q9: On which continent are you based? (N=42)



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