



## 1. BACKGROUND: NECESSITY AND CAUSE

Defined as the **MISSION 2020**, the main objectives of the Hepatitis Prevention, Control, and Elimination (HPCE) Program in Mongolia are straightforward yet very ambitious:

### MISSION 2020

- To eliminate cancer-causing hepatitis C virus in Mongolia by 2020
- To reduce mortalities related to liver cirrhosis and liver cancer by 50% in Mongolia by 2020

Prevention, early diagnosis and treatment of infected patients are three pillars of infectious disease control. Viral hepatitis is not only an infectious disease, but also it is the main cause of deadly liver cirrhosis and liver cancer. In 2010, liver cancer was the third leading cause of cancer mortalities globally. It was also reported that hepatitis B (HBV) and C (HCV) together killed 1.285 million people in 2010, which is more than number of mortalities due to malaria or tuberculosis (1).

Mongolia has the world's highest rate of liver cancer mortality—nearly eight times the global average (Fig. 1). Prevalence of chronic viral hepatitis B, C, and D (HDV) in Mongolia is at an endemic level and constitutes the main cause for Mongolia's world-leading liver cancer mortality rate, which has been steadily increasing over the last decade. At the moment, liver cirrhosis and

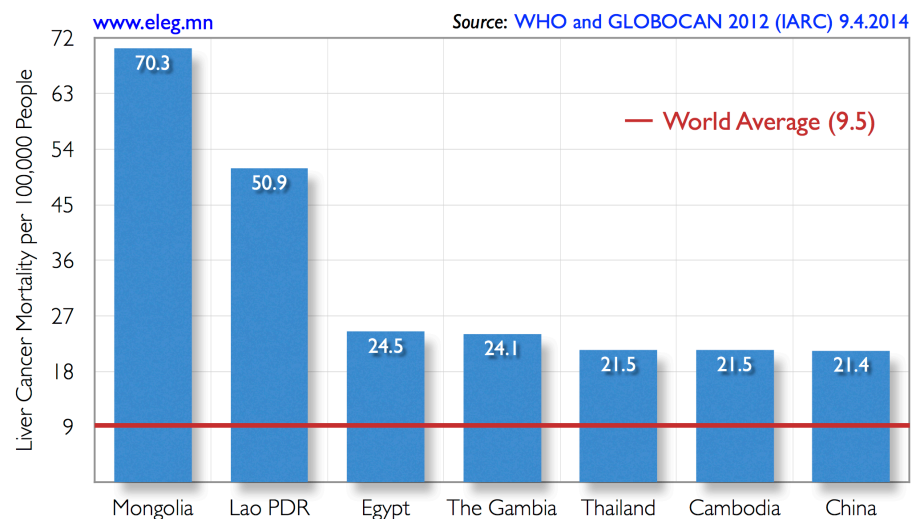


Fig. 1. Top 7 countries in the world with the highest annual liver cancer mortality rates

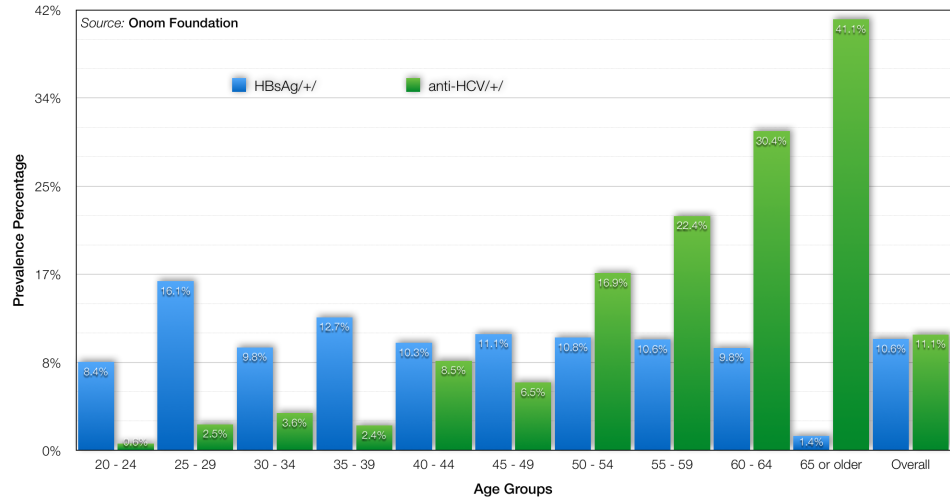
liver cancer mortalities account for 15% of all annual mortalities in Mongolia, and it is projected to increase in the future. In short, the viral hepatitis endemic is wreaking havoc in Mongolian society, and it hits very close to home. Our uncles died of liver cancer at young ages of 51 and 57 and our parents have chronic viral hepatitis infections. One of our best friends, a college classmate has HBV and HDV superinfection, leading to an accelerated liver damage that will probably prompt him to get liver transplantation soon. Such heartbreaking tragedies in our personal lives and in Mongolian society compel us to do whatever we can to help to mitigate the endemic of viral hepatitis. Deficiencies in the Mongolian health care system for prevention, early diagnosis and control of chronic conditions compound the endemic. If we can help to prevent even one person from having a liver cancer via improved prevention, early diagnosis, and treatment for viral hepatitis, it means the world to us. It is not only meaningful to us, it's personal. With this determination, we are implementing the HPCE Program by bringing breakthrough innovations and technologies, industry cooperations, and novel implementation approaches together to achieve the **MISSION 2020** of eliminating a major cancer-causing infectious disease in a country for the first time in world history and reducing disproportionate, sustained burden of liver cirrhosis and liver cancer mortalities significantly in a country with the highest rate of liver cancer mortality in the world.



## 2. MISSION AND EXPECTED RESULTS

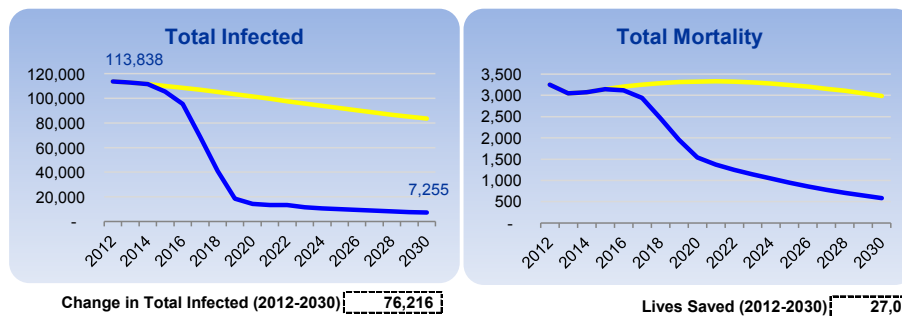
Is the **MISSION 2020** attainable? Based on solid scientific findings, facts, and evidences, we confidently infer that the **MISSION 2020** is indeed attainable. In our epidemiological study that determined the prevalence of viral hepatitis in Mongolia in 2013, we discovered that there is a cohort effect for chronic HCV wherein some high risk factor in the past is no longer occurring, which in turn means that a probability for re-infection of HCV after getting treatment is less pronounced (**Fig. 2**). Based on this scientific finding, we conclude that it is practically feasible to eliminate HCV in Mongolia by utilizing revolutionary new HCV treatments.

In addition, using the age distribution of the viral hepatitis prevalence and population statistics, we estimate that roughly 115K people have chronic HCV infection, while roughly 200K people have chronic HBV infection in Mongolia. These population sizes are manageable.



**Fig. 2.** Prevalence of HBV and HCV among Mongolian population in different age groups

In other words, with relatively small viral hepatitis prevalent population sizes combined with the cohort effect for HCV infection, Mongolia might be the only country where viral hepatitis is highly prevalent and causes devastating effects on its society, yet it is possible to eliminate HCV and to control HBV in relatively short amount of time. In fact, according to hepatitis treatment simulation study that we published in *January 2015 issue of the Journal of Viral Hepatitis* (**2, 3, and 4**) along with colleagues, elimination of chronic HCV in Mongolia can be achieved by 2020 if roughly 15K patients treated annually starting in



**Fig. 3.** HCV treatment dynamics modeling output: Elimination of HCV in Mongolia by 2020 2030 in the process of eliminating HCV in Mongolia. These results are truly remarkable and demonstrate the true impact of the HPCE Program in making a difference in lives of ordinary Mongolians. Finally, working with the Onom Foundation and its partners, you can set a shining example in eradicating viral hepatitis for the whole world to follow suit since the elimination of HCV and control of HBV and HDV in Mongolia will serve as a model for other countries in the world with high prevalence and burden of viral hepatitis.



### 3. IMPLEMENTATION OVERVIEW

The Hepatitis Prevention, Control, and Elimination Program in Mongolia is a comprehensive national program that is divided into three main intrinsically inter-dependent campaigns with specific focuses on prevention, early diagnosis, and treatment:

**Prevention Campaign**— Nationwide public health campaign will be conducted to increase awareness and knowledge of Mongolian public about viral hepatitis and its deadly consequences and ways of preventing viral hepatitis infection and protecting loved-ones from this life-threatening disease. Analysis of data from public knowledge and awareness assessment surveys will be used to regularly optimize the design and execution of the public health campaign. In addition to the public health campaign, HBV vaccination of high-risk groups such as healthcare workers and emergency responders will be intensified around Mongolia. In fact, the plan is to vaccinate all healthcare workers and other high-risk groups in Mongolia against HBV and install a system in place to continue the vaccination. With these measures, prevalence of HBV and HDV will be controlled and ultimately lowered in Mongolia.

**Screening and Early Diagnosis Campaign**— Before dwelling into the details of the screening campaign, we would like to provide an interesting statistics. According to the US Central Intelligence Agency, Mongolia has a population of 2.95 million, while it has 3.4 million mobile phone subscribers, indicating extensive penetration of mobile phones. Not only the penetration is high, but also cellular network effectively covers every corner of the country despite Mongolia's enormous land mass. With such ubiquitous mobile phone usage among Mongolian population, mobile phones are the most effective communication tool for combating the viral hepatitis endemic that we can extensively utilize not only in the decentralized screening and early diagnosis campaign, but also in hepatitis prevention and treatment activities. Now getting back to the screening campaign, we would like to note that there are approximately 315,000 people with chronic viral hepatitis infections in Mongolia, according of our recent population-based epidemiological study of viral hepatitis prevalence in Mongolia. Identifying and registering these people with chronic hepatitis infections will be the key to achieving the **MISSION 2020** of the HPCE Program. Therefore, it is our plan to conduct decentralized nationwide screening for viral hepatitis infection, to identify and register HBV and HCV infection status of everyone in Mongolia using inexpensive, on-site, rapid tests that can be performed at the 567 primary and secondary healthcare facilities throughout Mongolia. Once hepatitis testing is performed, doctor would send the test result via SMS message to the Mobile Messaging Platform along with individual's name and national identification number to register into the National Viral Hepatitis Database. To demonstrate its feasibility, we have already piloted this system and have 5806 valid registrations into the National Viral Hepatitis Database as of January 12, 2015. In other words, we will be using the power of crowdsourcing to register every individual tested for viral hepatitis infections into the National Viral Hepatitis Database via the Mobile Messaging Platform. Blood samples of people with viral hepatitis infections will be collected using ViveBio's new class of ambient temperature, dry blood transportation system for further quantitative testing at central laboratories to determine their treatment eligibility.

**Treatment Campaign**— Thanks to industry cooperation for the HPCE Program, the most effective and breakthrough medicines for chronic viral hepatitis will be introduced in Mongolia with over 98% discount of the world market price. For instance: Gilead Sciences, a biopharmaceutical giant that is leading research, development, and introduction of revolutionary new treatments for chronic viral hepatitis, is a partner of the HPCE Program in Mongolia. Thanks to Gilead's Access Partnerships

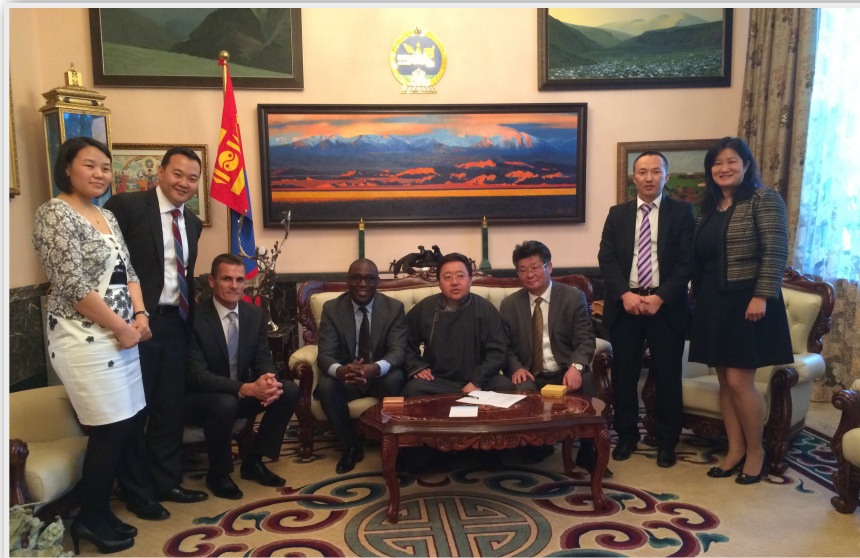


Program in which Gilead makes it a priority to increase access to these life-saving medicines for people who can benefit from them, regardless of where they live or their economic status, Gilead Sciences has taken concrete steps to reduce the costs of these life-saving medications for HCV and HBV by over 98% in Mongolia—an extraordinary in kind commitment of over **US\$12 Billion**. In fact, official registrations of these life-saving breakthrough medicines with the Ministry of Health and Sports of Mongolia. As part of the treatment campaign, over 110,000 people with chronic HCV will be cured by 2020. Over 100,000 people with chronic HBV will be enrolled into antiviral treatment regimen. As a result, mortalities related to liver cirrhosis and liver cancer in Mongolia will be reduced by 50% by 2020 and cancer-causing HCV will be eliminated in Mongolia.

On top of these campaigns, we are also establishing a comprehensive research program to investigate a number of aspects ranging from health economics to clinical trials.

#### 4. UNIQUE PUBLIC-PRIVATE PARTNERSHIP AND COLLABORATION

The Hepatitis Prevention, Control, and Elimination Program is not a straightforward government program, rather it is a comprehensive national program put forward by the Onom Foundation, a civil society institution that has the most in-depth institutional knowledge and hands-on expertise on all aspects of viral hepatitis endemic in Mongolia. To date, the Onom Foundation along with its partners has successfully carried out a viral hepatitis prevalence study, conducted public health campaigns, organized national conferences and training sessions for healthcare professionals, orchestrated roundtable discussions among policy makers, developed a comprehensive national program, and brought all stakeholders together to agree on an action plan to combat viral hepatitis in Mongolia.



**Fig. 5.** A photo taken with **Mr. Tsakhia Elbegdorj, President of Mongolia** in June of 2014. President Elbegdorj personally committed to support the Hepatitis Prevention, Control, and Elimination Program in Mongolia. In the photo, from the left: *Naranjargal Dashdorj, MD, PhD, Co-Founder and Chief Executive Officer, Onom Foundation, Naranbaatar Dashdorj, PhD, Co-Founder and Chairman, Onom Foundation, Aaron Brinkworth, Senior Director, Access Operations & Emerging Markets, Gilead Sciences, Inc, Clifford Samuel, Vice President, Access Operations & Emerging Markets, Gilead Sciences, Inc. Mr. Tsakhia Elbegdorj, President of*

*Mongolia, Prof. P. Nymadawa, Vice President of the Mongolian Academy of Sciences and Former Minister of Health, J. Amarsanaa, MD, PhD, Former Vice Minister of Health of Mongolia, Betty Chiang, MD, Medical Director, Access Operations & Emerging Markets, Gilead Sciences, Inc.*

Because of this unique situation, the Hepatitis Prevention, Control, and Elimination Program calls for an innovative public-private partnership along the lines of the Smart Government Platform that **Mr. Tsakhia Elbegdorj, the President of Mongolia**, proposed at the publicly broadcast event, “*From a Big Government to a Smart Government*” on November 26, 2013. **President Elbegdorj** defines





“*Smart Government*” as a combination of skilled people, technological advancements, research, and laws that all add up to creating a new mindset of how government must serve its citizens and enable (and not hinder) private sector and civil society development. In our opinion, the Hepatitis Prevention, Control, and Elimination Program provides an ideal example of this new model of government serving its citizens by enabling civil society initiatives.

To implement the HPCE Program in Mongolia, we are augmenting a worldwide cooperation among funding agencies, research universities, healthcare companies, all relevant public and private institutions, and the Government of Mongolia. In this cooperative process, the Onom Foundation is serving as an anchor organization along with its partners to coordinate the implementation of the HPCE Program in Mongolia. Currently, the HPCE Program has the support of industry leaders such as Gilead Sciences, Abbott, Novartis, Sysmex Corporation, BMS, ViveBio, Eiger Biopharmaceuticals, Echosens, Daktari Diagnostics, and others. In addition, there are a number of academic and research institutions and faculty members at these institutions that we are exchanging ideas and actively pursuing some research collaborations. Examples of such institutions include Stanford University, University of Chicago, Harvard University, George Washington University, Center for Disease Analysis, and Mongolian National University of Medical Sciences. Furthermore, we have been interacting with and getting helpful feedbacks from experts at the World Health Organization, World Hepatitis Alliance, US National Institutes of Health and Centers for Disease Control and Prevention on the design of the HPCE Program. Finally, the HPCE Program has the full support of the Government of Mongolia, and we enjoy close cooperation at every level of the Government of Mongolia, starting with the Parliament and Ministry of Health and Sports. We would like to note that all of these partners are bringing enormous value to the HPCE Program. With these commitments and concrete steps on the ground in Mongolia, there is an unmistakable agglomeration of cooperative actions and forces united in the vision of eliminating HCV and controlling HBV and HDV in Mongolia, which in turn will serve as a model for other countries in the world in their fight against viral hepatitis.

## REFERENCES

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