

Study on Taiwan's sports promotion strategies and its dynamic impacts on national health care

By Tian-Syung Lan,

Professor & Dean, Department & Graduate Institute of Information Management,

Yu Da University of Science and Technology

Abstract

Population health is a major asset in a country as well as a key factor in raising the competition of a country. In Taiwan, chronic illness and aged disability are accompanied with elderly society of the growing old population. Thus, the heavy loads of health care and mental pressure are resulted to the family, society, and country. It is found in many existing researches that regular athletics can boost the normal operation inside the human body to achieve the health benefit in slowing becoming old and reducing getting disabled. In order to educate the entire population to maintain good athletic habits, the government is actively propagating the athletic promotion policies in raising the awareness of sports participation and health care. Through sturdy physique and capability, the external virus is defended. And, the medical or health insurance budget can be reduced.

In this project, the System Dynamics (SD) is primarily introduced to construct the stock-flow diagram and the Vensim software is utilized to simulate the dynamic situations from the system. The dynamic effect of health care for entire population by athletic policy promotion and medical budget is proposed to be studied. The policy simulation results show that the medium policy promotion can be improved by 55% and the entire population health can be improved by 5% in two years.

The decision maker often find important to accurately judge among various policies in a short period of time. The proposed dynamic simulation techniques can definitely be modified by actual environment as well as the interactions between

the industries to fully describe the overall system. The simulated results are surely the critical reference for the policy promotion to the government.

Keywords: entire population athletics, preventive health care, system dynamics

1. Preface

This study is to utilize the situational simulation of system dynamics and proceed situational simulations with regard to our sports promotional strategies, national health care effects and the future development. And the simulation result could be taken as reference principle of adjusting sports promotional strategies.

1.1 Research background and motives

According to the World Health Organization (WHO), the study indicates that insufficient physical activities is now the fourth major factor attributed to the global death rate. In a large number of countries, there is an increasing proportion of inactive population. There are about 21% to 25% breast cancer and colon cancer, 27% diabetes and 30% ischemic heart disease, the main cause of these cancers is attributed to insubstantial physical activities. How to put sports into good practice in people's daily life and how to actively manage national health care so as to promote nationals mental and physical health will become an issue which all people would like to move and improve. Therefore, it is significant to apply a situational method to simulate the interrelationship between sports promotional strategies and national health care. Thus, it becomes the motive of this research.

2. Literature review

Literature review is an important theoretical basis in a research and also to support the rationality of the research. The following passages are to discuss the relevant issues.

2.1 Construct a Sports Island

In the recent years, Sports Administration, Ministry of Education, has carried out the promise given by President Ma during his campaign, building Taiwan as a Sports Island. Taking references of nationwide sports development in Germany, America, Australia, China, Japan and Korea with considerations of Taiwan's national sports development, the authority takes the concept of Pleasure in Sports and Live Healthily and brings the Sports Island Establishment Project for 4 years from 2010 to 2013. The estimated budge is 1.6 billion dollars. Its visions and structure is as followed (see Figure 1).



Figure 1 Visions of Sports Island Establishment Project (Wu, Long Sang 2012)

2.2 The relationship between sports and physical strength

There is a close relationship between sports and physical strength. Saltin and Pilegaard (2002) from Denmark point out that regular sports can boost the health condition of muscle metabolism and there are significant impacts on the prevention from diseases. Working out for three times a week also can enhance the metabolism function of muscles and postpone the happening chance of chronic disease. Even doing low-strength sports is beneficial to muscle health improvement (Chang, Ru-Je, 2002).

2.3 The relationship between sports, health and disease

Regarding to the benefits of physical activities on prevention of cardiovascular diseases, plenty of researches are done abroad and the results all point out that physical activities can avoid the happening of cardiovascular disease. The proportion of sedentary people who die of cardiovascular disease is 1.5 or 2 times higher than that of people who do middle-strength sports (Centers for Disease Control and prevention, 1996). Besides, some other studies indicate that people who have a sedentary or low-level of physical activities lifestyle, once they carry out moderate physical activities, there will be a great help to prevent from cardiovascular diseases.

Table 1: Related researches on physical activities and cardiovascular diseases (Liang, Li Juan, 2008)

Author (year)	Sample size	Study Design	Study factor	Outcome factor	Results
Ekelund (1988)	3,106 US males	Cohort 26 years	Submaximal aerobic capacity estimated from exercise test	CVD deaths	Inverse association $R_{rmax}=2.7$ DR, adj
Blair (1989)	13,300 US males, females	Cohort 8.5 years	Maximal aerobic capacity estimated by exercise test	CVD deaths	Inverse association $R_{rmax}=2.3$ DR, adj
Linsted (1991)	9,484 Seventh Day Adventist	Cohort 7.1 years	Self reported to single PA question	CVD deaths	Inverse association $RR=0.79$ Not significant

CVD : cardiovascular diseases

PA : physical activity

DR : evidence of dose response

Adj : adjusted for confounders (body mass index, age, chol, smoking etc)

PR : relative risk

$RR>1$ indicates increased risks for sedentary compared to most active group

From the above-mentioned information, there is an inseparable relationship among sports, healthy physical conditions and cardiovascular diseases.

2.4 System Dynamics

System Dynamics (SD) is a computer simulating model created by Professor Jay Forrester of the Massachusetts Institute of Technology in 1956. In order to combine systematic analysis methodologies, policy-making theory, information feedback control theory and computer simulation technology as the theoretical basis, its purpose is to simulate and improve high-level, nonlinear and many circular dynamic complex system. Because SD can effectively solve the general calculating analysis model and the uneasy quantifying variables in the dynamic situations and other disadvantages. Therefore, the simulating system can create a factual situation close to the real environment (Tsai, Ya Hsiu, 2007)

2.5 Achievement of current sports policy operation

According to the survey and reports by in 2012 Sports Administration in 2012, the regular-sports population proportion has risen from 27.8% (2011) to 30.4%. In 2012, more than 28,000 people took part in cross-lake swimming game at the Sun Moon Lake. Besides, more than 120,000 people participated in Taipei Fubon Marathon. Therefore, imposed in the rising sporting atmosphere, more Taiwanese people start getting involved in the challenging large-scale sports events.

2.6 Policies are to be improved

The development of emerging sports gives positive meaning of people's leisure demands. Apart from the general and traditional sports. With the promotion of

mass media there are more abundant and entertaining.

However, the relevant regulations of high-risk sports and counseling institutes are in a dire need to be established.

2.7 Taking the strategies abroad for reference

In 2010, the Japanese government announces a strategy that sports as a nation's foundation and would take it as the base of the next-decade sports development principle. Thus they can reach the target of sports community. Moreover, in the UK policy, A Sporting Habit for Life: 2012-2017, it emphasizes three concrete targets to improve: 1). all people from elementary school, junior and senior high school, colleges and universities to workplace shall participate in sporting activities; 2). Particularly, the young population from 14 to 25 years old shall exercise once a week and this policy would try to reduce the sports dropout of the people who are above 25 years old; 3). Encouraging adults to take part in sports.

3. Research methods

The following passages are to explain the Causal Feedback Loop Diagram and Stock-Flow Diagram constructed in this research.

3.1 Modeling construction

The Causal Feedback Loop Diagram and Stock-Flow Diagram constructed in this research are as followed:

3.1.1 Causal Feedback Loop Diagram

The Causal Feedback Loop Diagram in this research is as followed (Figure 2).

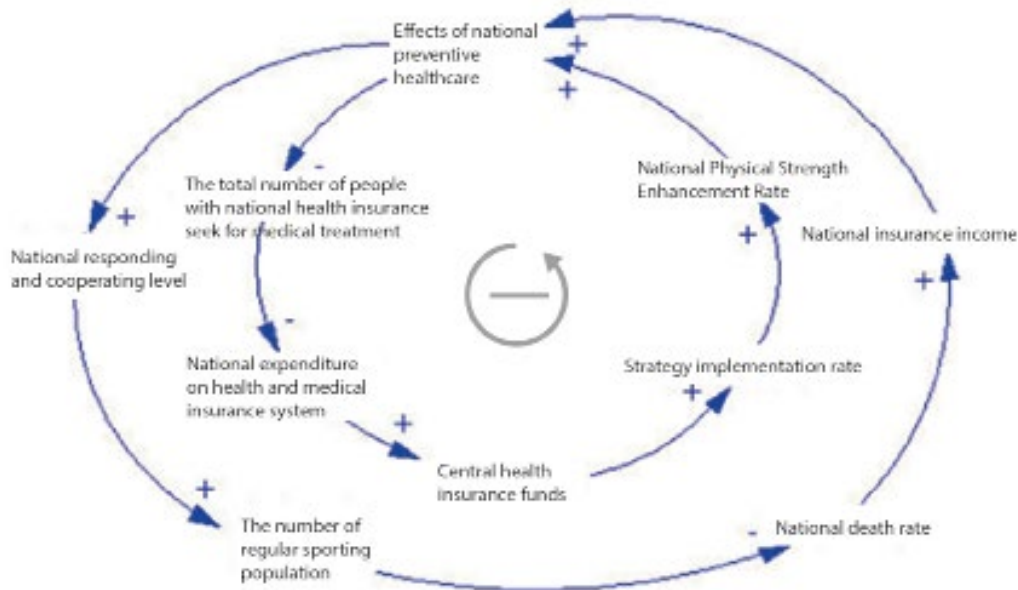


Figure 2 Causal Feedback Loop Diagram

Let's start from the inner circle: when a nation receives good effects of national preventive healthcare, there are few number of people with the national health insurance seek for medical treatment; that is, the national expenditure on health and medical insurance system would be reduced accordingly. In other words, when a nation spends little on health and medical insurance, the central government would have sufficient funds. When the central government have enough health and medical funds, more sports policies could be promoted and benefit people's mental and physical health conditions. And under the condition of enough funds, the strategy implementation rate would be lifted. When the strategy implementation rate increases, national physical strength will also climb up. Consequently, when national physical strength is boosted, we would achieve the effects of national preventive healthcare.

While making good effects of national preventive healthcare, we see an extremely high level that all people respond to and cooperate with sports strategies promoted by the government which develop physical and mental health conditions. Through a high-cooperating level, the country further increases the sporting population without any stop. With ultimate cooperation, regular sporting population would keep on increasing. When national have trained themselves and owned a fit body, they will postpone the declining body functions and aging process. Besides,

when the aging physical functions are delayed, there would a lower national death rate. And when the death rate becomes lower, there will be more people who pay the insurance fees and thus, the central insurance funds and revenue would increase at a large rate. Putting in other words, when a nation's income of health insurance increase greatly, it means that a nation has received good results and effects of national preventive healthcare.

3.1.2 Stock-Flow Diagram

The Stock-Flow Diagram in this study is as followed (Figure 3).

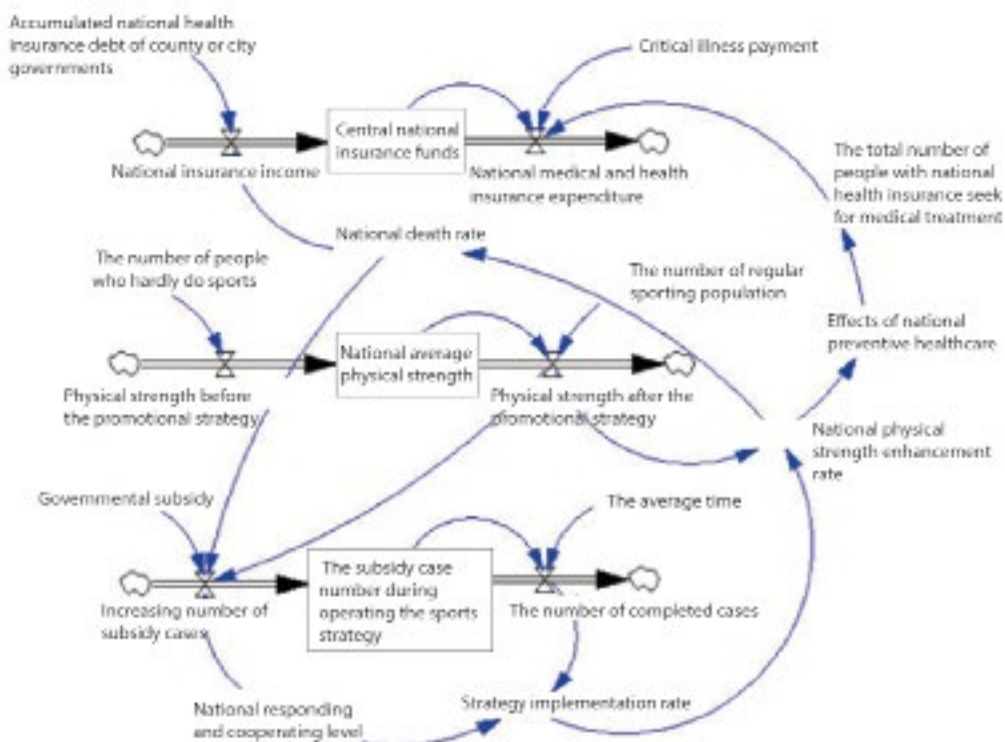


Figure 3 Stock-Flow Diagram

First of all, we use strategy implementation rate, a variable, to start this model. Initially, the government plans to promote nationwide sporting atmosphere and further enhance national physical strength. If physical strength is increasing, there's more chance to prevent from diseases and further decrease national death rate and prolong the average lifespan. While the average lifespan increases, consequently there will be more people to pay health insurance fees. Furthermore, this can reduce the accumulated health insurance debts of county

or city governments. And with increasing national physical strength, there are better achievement of national preventive healthcare and few people seek for medical treatment. When the people seek for medical becomes fewer, the medical and health insurance expenditure will be also decreased. There will be more insurance income for the government to cover critical illness and realize the policy: take good care of disprivilege group or people.

When the national death rate cannot be lowered, the government needs to spend more insurance funds to stimulate sporting willingness and make those who hardly do sports understand the importance of sports vis-à-vis physical health. Meanwhile, the number of regular sporting population would keep going up and these two targets could be achieved at the same time. Overall, when the national cooperating level is high, the number of completed cases would be also increasing. Thus, the whole strategy could be carried out smoothly and serve the purposes. Also for those who promote the strategy, they would be more active to operate the laws which are beneficial to people's physical and mental health. Accordingly the pressure to increase insurance fees would be eased and on the contrary, people would have more trust and confidence in the government.

4. Results and discussions

Using the system dynamic model constructed by System Dynamics, the following passages are to proceed the strategic situation simulation and to discuss.

4.1 Simulation and results

In this study, we choose high, middle, low strategy implementation rates and see the influences on the future development of national health insurance and meanwhile carry out the simulation for the next two years. At first, we are to adjust two variables, strategy implementation rate and national death rate and compare it with central national insurance funds, medical and health insurance expenses, the achievement of national preventive healthcare and so on. Then we can find out the best strategy implementation rate of national health insurance.

In the first strategy condition, we setup the conditions as followed: high strategy implementation rate (85%), national death rate (20%), national physical strength enhancement rate (5%), and national responding and cooperating level (0.5) and proceed the simulation (see Figure 4).

From the above Figure, when the government actively promote national health insurance and sports strategy, people might enthusiastically get involved for the first 11 months. Therefore most people might boost their

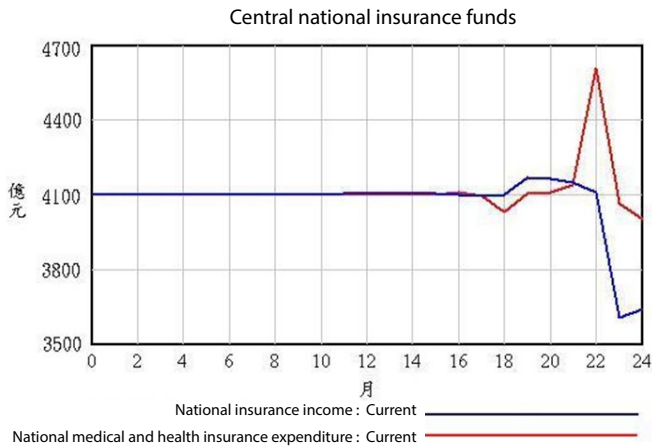


Figure 4: Central national insurance funds at the high strategy implementation rate

physical strength and immune system might be bettered. The number of people with national health insurance seek for medical treatment would be greatly reduced. And furthermore, the insurance income would be far more than expense. But from the 22nd month onwards, the total expense, 460 billion dollars, is far more than the total income, 410 billion dollars. The reason is that the body reacts due to the excessive sports and the immune ability drops; accordingly, the number of people with national health insurance search for medical assistance enlarges and the expense also increases.

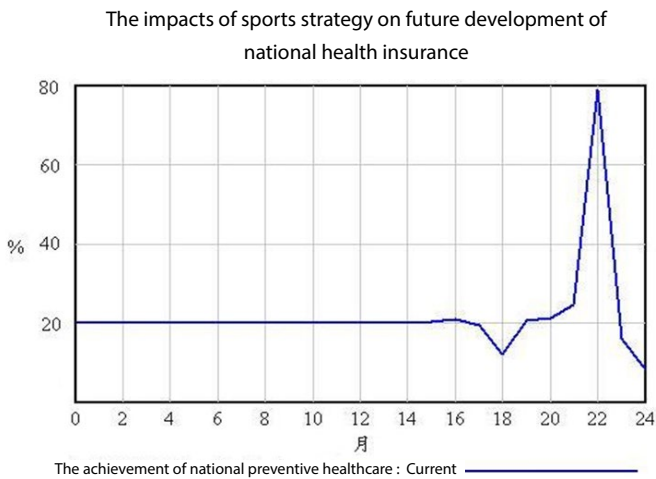


Figure 5: The developing trends of national preventive healthcare at the high strategy implementation rate

The impacts of sports strategy on national health insurance future development

From Figure 5, it indicates that at the high strategy implementation rate, the future development of national health insurance goes down from 20% in the first 15 months to 16% from the 18th month onwards. The reason is that on the initial stage of strategy implementation could not receive immediate effects and the public assume it might be another blank check of the government. However, when the strategy takes effects in the 21st month, the development starts receiving positive

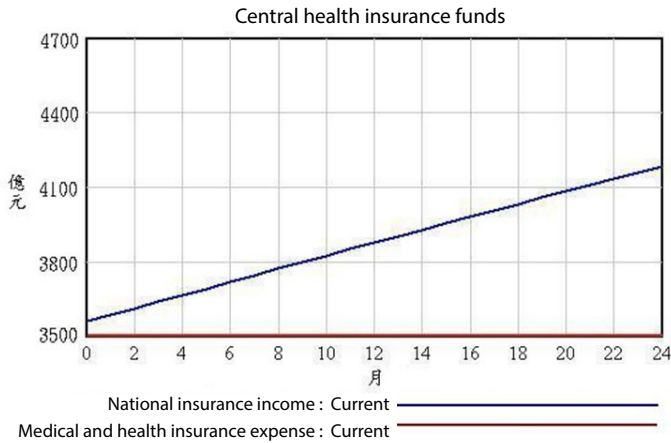


Figure 6: Central health insurance funds at the middle strategy implementation rate

comments and soars up to 79%. In the end, the development goes down to the bottom like a flash in the pan. Because the government would like to promote nationwide sports and gives abundant subsidy terms, greatly welcomed by the public. Many people rush to take part in all sorts of sports sponsored by the government. However, due to the expense was too much a burden, the effects of national health and sports strategy gradually lost its leverage and stopped at the end.

In the second strategy situation, we setup the conditions: high strategy implementation rate (55%), national death rate (20%), national physical strength enhancement rate (5%), and national responding and cooperating level (0.5) and proceed the simulation (see Figure 6).

In Figure 6, we know that when the government promote national health and sports strategy moderately, the insurance income slowly but steadily grow from 360 billion dollars in the early implementation stage to 415 billion dollars. During this period of time, the medical and health insurance expenses do not increase. The main reason is that this strategy unlike the first strategy; that is, people would like

The impacts of sports strategy on future development of national health insurance

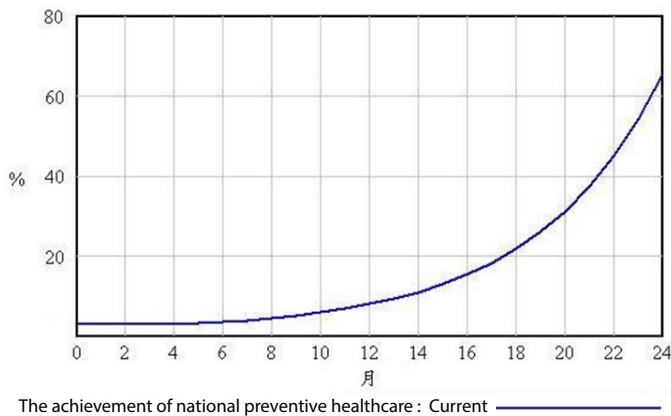


Figure 7: The development of national health insurance at the middle strategy implementation rate

to earn the huge amount of subsidy so they take part in the kinds of sports held by the government. At the end, the subsidy shrinks because too many applications. This strategy is that the government would evaluate the then situation and release the subsidy terms. This method won't make people to give up their participations due to financial pressure if the budget is limited.

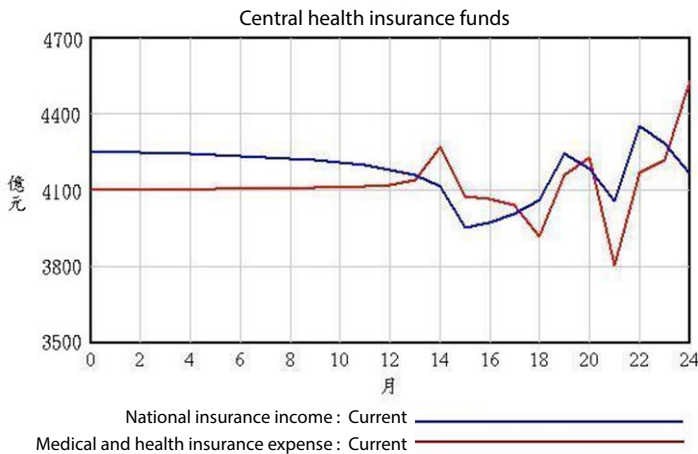


Figure 8: Central health insurance funds at the low strategy implementation rate

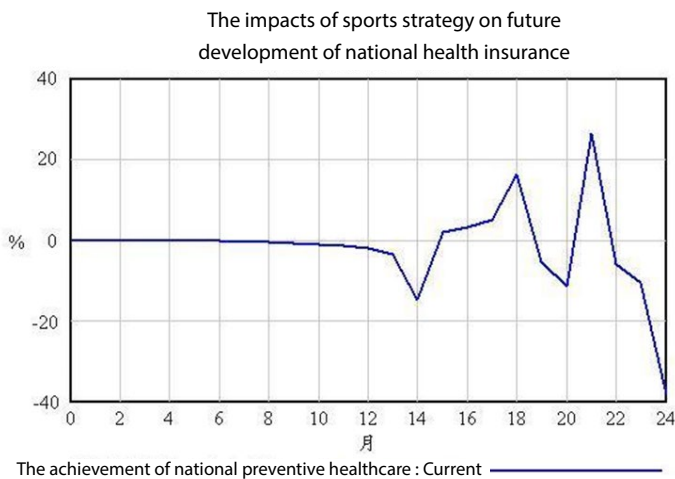


Figure 9: The development of national health insurance at the low strategy implementation rate

In Figure 7, the development of national health insurance at the middle strategy implementation rate become better from 4% on the early initial implementation stage up to 65% later on. Though the progress is unlike that in the 1st strategy, 79%. However, the later development appears good and lasts longer in the near future. This strategy, unlike the 1st strategy, the government speeds up to promote the national health insurance and sports strategy. As a result, the subsidy is over-released and too many people compete to participate. Thus, this good development could not last too long. Therefore, this is the problem in the 1st strategy during the implementation stage. In the other way, when the government moderately manage a budget to implement, this sports strategy would serve the purpose and last longer.

In the third strategy situation, we setup the conditions: low strategy implementation rate (25%), national death rate (20%), national physical strength enhancement rate (5%), and

national responding and cooperating level (0.5) and proceed the simulation (see Figure 8).

In Figure 8, we can see when the government does not care about national health and sports strategy, after calculating the insurance income and expenses, the surplus is 15 billion dollars. After a period of time, the medical and health insurance expenses will reach high up to 450 billion dollars. When the insurance income is only 415 billion dollars. The difference between income and expenses will generate 35 billion dollars. The reason is that Taiwan's population has moved towards the aging society. If people do not do sports in their daily life to postpone the aging physical functions and enhance immune system to fight against diseases. Consequently, the national insurance fees would have to be increased so as to support the lasting implement of the national health insurance system.

In Figure 9, the development of the national health insurance at the low strategy implementation rate decreases from the 9th to the 14th month. The reason is that the government does not actively promote the importance of sports to health and disease prevention. Plus, the commonly hasty lifestyle makes most of people neglect to maintain a good sporting habit. Only a certain part of population would continue working out; thus, in the 21st month we see a temporary growth rate, 25%, (Figure 9). However, the later development cannot overcome the influence of people's real life. Consequently, the national preventive health insurance strategy fails quickly.

The results of the situational simulations in this research indicates that Taiwan's government, before promoting and operating the national health insurance and sports strategies, can take the 2nd strategy situation and the relevant terms as references to establish the details of the sports strategy. In addition, regarding to the subsidy distribution, excessive funds will cause so many application cases that the authority cannot operate with all force. In the contrary, the funds are insufficient that the implementation will not be effective and fail at the end. Accordingly, in both conditions of excess and insufficiency, the government shall always evaluate the then conditions and make adjustable changes.



5. Conclusion

Based on the study results, how much government cares about the sports-promoting strategy, its implementation rate and national death rate have immense impacts on the future development of national health insurance. Furthermore, we can say that it directly affects the whole nation's strength. If the sporting strategy successfully creates nationwide sporting waves and encourage all people to do exercise and boost their cardiovascular functions, enhance immunity and prevention from disease. As expected, it could save a greatly consideration expense of national medical and health insurance; more importantly, it would postpone the rising national insurance fees.

Through the study on Taiwan's sports promotion strategies and its dynamic impacts on national health care, it can provide basic references for the governmental authority when they manage the strategy and distribute the funds so as to enhance the physical strength of Taiwanese people. At the same time, the national competitiveness could be strengthened.

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