Tobacco control and Healthy China 2030

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ABSTRACT

Background The Healthy China 2030 strategy sets ambitious targets for China's policy-makers, including a decrease in the smoking rate from 27.7% in 2015 to 20% by 2030. China has made progress on tobacco control in recent years, but many key measures remain underused. This study explores the potential for full implementation of these measures to achieve the targeted reduction in smoking by 2030.

Methods First, a 'business as usual' scenario for China's cigarette market was developed based only on underlying economic parameters. Second, non-price tobacco control measures were then added assuming they are fully implemented by 2030. Third, excise per pack was raised to a level that would increase the real price of cigarettes by 50% in 2030.

Findings Under the business as usual scenario, the rate of smoking falls to around 26.6% in 2030. When non-price measures are included, the rate of smoking falls to 22.0% (20.9%~23.1%). Thus, non-price measures alone are unlikely to achieve the Healthy China target. Under the third scenario, excise per pack was roughly doubled in 2030 in order to increase real cigarette prices by 50%. The rate of smoking then falls to 19.7% (18.2%~21.3%), reflecting 78 million (59~97 million) fewer smokers compared with 2016. In addition, real excise revenue from cigarettes increases by 21% (−3%~47%) compared with 2016.

Conclusion Significantly higher tobacco taxes will be needed to achieve Healthy China 2030 target for reduced smoking even after the implementation of other tobacco control measures.

INTRODUCTION

In October 2016, President Xi Jinping announced a new national strategy: Healthy China 2030, which sets ambitious targets for the government to achieve including a decrease in the rate of smoking to 20% by 2030.[1 2] China's policy-makers have a number of tobacco control measures at their disposal to achieve this target. These measures are outlined in Articles of the WHO Framework Convention on Tobacco Control (WHO FCTC) and in the WHO MPOWER package of recommended tobacco control policies for country-level implementation of the WHO FCTC.[3 4] China and other members of the United Nations General Assembly also endorsed the 2030 agenda for Sustainable Development in September 2015.[5] This agenda sets out 17 Sustainable Development Goals (SDGs) and 169 targets that all countries have agreed to achieve by 2030, including target 3.a to 'strengthen country-level implementation of the WHO FCTC'.[5]

The new SDGs are a successor to the Millennium Development Goals (MDGs) that were in place over 2000–2015. Efforts by countries to achieve the MDGs have led to many improvements globally, including a large decrease in the number of people living in extreme poverty most notably in China and India.[6] However, the MDGs also highlighted limitations with the global development framework, including a tendency for 'verticalization' of health and other development programmes.[7] The new SDGs reflect an evolution of thinking about development, with more emphasis placed on integrated, multisectoral approaches. Tobacco taxation is a prime example of this multisectoral approach, with progress needing to be underpinned by greater policy coherence between the health and finance sectors of government. It seems likely that China will need to apply similar reasoning to achieve the Healthy China 2030 strategy.

This paper takes and adapts the 'effect sizes' from Levy *et al* to assess the potential for tobacco control measures that are currently underused in China to reduce the rate of smoking in China by 2030.[8 9] This approach highlights that non-price measures can make a significant contribution, while also signalling that higher levels of tobacco taxation will be needed to achieve the Healthy China 2030 target.

METHODOLOGY
Business as usual scenario
Annual statistics published by the government on cigarette prices and retail sale volumes were entered into the WHO Tobacco Tax Simulation (TaXSiM) model to create a baseline profile of China's market in 2016.[10–13] This baseline includes the Chinese Centre for Disease Control and Prevention (CDC) finding from 2015 that 27.7% of adults smoke.[2] The TaXSiM model was initially developed as a tool to predict the short-term impact of tax increases on average cigarette prices, consumption and excise revenue.[14 15] However, it has been extended in this study by incorporating UN projections of key macroeconomic variables (adult population by gender, economic growth and inflation).[16 17] Two microeconomic or behavioural variables—the price and income elasticities of demand—also determine the path for cigarette consumption. This is especially the case for the 'business as usual' scenario that assumes no new or additional tobacco control measures are implemented over 2017–2030.

In many countries, cigarette demand functions like a 'normal good' meaning that cigarette consumption increases as household incomes grow. The income elasticity of demand therefore tends to be positive, with evidence suggesting that it ranges between 0 and 0.6 in developing countries.[18] In China, both the rate and intensity (ie, sticks per day) of smoking is already relatively high compared with many other countries.[4] Therefore, we adopt a conservative assumption that the income elasticity

of demand for cigarettes in China is lower at 0.2 (within a range ±25%) meaning that a 10% increase in real per capita income will increase cigarette consumption by about 2%. The income effect was also incorporated into the model by including a small amount of brand upgrading by consumers each year.

The price elasticity of demand for cigarettes acts in the opposite direction to income by reducing cigarette consumption. The evidence suggests that the price elasticity of demand for cigarettes clusters around −0.5 in developing countries.[18 19] Several recent studies in China have also found that the price elasticity of demand is around −0.5 for China's smokers.[20 21] The model therefore uses a price elasticity of −0.5 (range ±25%) meaning that a 10% increase in real cigarette prices will reduce total cigarette consumption by about 5%. The price elasticity of demand for tobacco reflects a combination of use (prevalence) and intensity (sticks per day), with the global evidence suggesting that each accounts for about half of the overall reduction in consumption.[19 22] We apply this evidence to both the price and income elasticities in the model so that both total cigarette consumption and smoking prevalence are affected by these behavioural variables.

As discussed, the business as usual scenario excludes any new tobacco control measures including the prospect of higher taxes. However, it is unrealistic to expect that cigarette prices will not change over time for instance as inflation increases. Consequently, the model assumes that the profit margins of China's cigarette manufacturers and distributors increase by inflation each year. Thus, the path for cigarette use and consumption under the business as usual scenario is essentially determined by the net effect of the income and price elasticities together with underlying macroeconomic trends.

Non-price tobacco control measures

Table 1 shows the key tobacco control measures recommended in the MPOWER package. The 'non-price measures' scenario includes the collective impact of fully implementing the first five MPOWER interventions by 2030. The third column shows the expected impact (effect size) of each measure from Levy *et al* based on a systematic review of the literature.[8 9] These effect

sizes should be interpreted as the relative percentage reduction in the rate of smoking from the full implementation of each measure.

However, China has already implemented certain elements of each MPOWER measure. For example, health warnings are in place, though they cover less than 50% of the pack surface. There is also a ban on most forms of direct advertising, with the exception of point of sale advertising. Table 1 shows the score assigned by WHO for the level of implementation of each intervention in China for 2017.[23] These scores range from 1 (not implemented) to 4 (fully implemented). Smoke-free laws are therefore the least implemented measure nationally, although there are smoke-free policies in a number of cities. By comparison, antitobacco mass media campaigns are scored as being fully implemented in 2017.

The impact of moving to full implementation of the non-price measures in China is predicted in our model by taking 100% of the effect size for measures with an implementation score of 1 and 50% of the effect size for measures with a partial implementation score of 2 or 3. This can be regarded as a conservative approach to modelling the marginal or additional impact of fully implementing both new and existing tobacco control measures. The final column of table 1 shows the effect sizes we therefore apply to China, within a range of ±25%. Note the effect sizes are applied as constant relative reductions to conservatively account for the collective effect of implementing multiple measures over the same timeframe (eg, to avoid overlapping impacts).[8]

Also note short-term effect sizes (covering a 5-year time horizon postimplementation) were used in this analysis because it will likely take China a number of years to fully implement all of these measures.[8] The prospect of early implementation, however, has been improved by the recent announcement that a new health commission will be taking over as the governing body responsible for implementing tobacco control in China.[24 25]

Tobacco taxation scenario

Higher tobacco taxation is widely regarded to be one of the most cost-effective tobacco control interventions available to countries.[18 19] Guidelines for implementation of Article 6 of the WHO FCTC emphasises that taxation should be part of any comprehensive national tobacco control strategy.[26] Under the third scenario, the impact of cigarette excise tax increases are included in addition to non-price measures above. Tobacco taxation is scored at 3 in terms of MPOWER implementation in China.[23] However, the share of excise in the retail price of cigarettes in China is around 34.5% compared with an average of 45% for all other middle income countries, and thus, there is significant scope for China to raise excise on cigarettes over the next decade.[13 27] Under the third scenario, excise per cigarette pack is raised to a level needed to increase the real price of cigarettes by 50% in 2030.

China's current excise system on cigarettes is very complex, with different specific and ad valorem rates being levied at both the producer and wholesale level of the supply chain (refer to table 2).[13] There are, therefore, many ways that China might reform and raise tobacco excise. In this study, we simply raise the specific rate that applies to wholesalers (currently 0.1 RMB/pack) until average retail prices increase by 50% in real terms by 2030. Note this approach is also broadly consistent with WHO guidance that countries should rely more on specific than on ad valorem rates when raising tobacco taxes.[26 27]

In terms of market impact, this approach will tend to increase the price of very cheap brands the most—a positive feature

Table 1 Short-term impact of MPOWER tobacco control interventions

Description of intervention	Effect sizes from the literature (%)	Implementation status – China*	Applied effect sizes for China† (%)
Non-price			
Smoke-free air laws	10.0‡	1	10.0±25
Cessation support	8.0‡	3	4.0±25
Health warnings	5.0‡	2	2.5±25
Mass media campaigns	8.0‡	4	Not applicable
Bans on advertising	4.0‡	3	2.0±25
Price			
Taxation	−0.5§	3	−0.50±25¶

*WHO (2018).
†Authors estimate based on WHO scores for implementation of MPOWER in China for 2017 (where score 1=100% of the effect size; score 2 or 3=50% of effect size; 4=not applicable).
‡Levy *et al* (2018).[8 9]
§NCI (2016).
¶Authors estimate based on findings in NCI (2016), Liu (2015)[20] and Bishop (2015).

Table 2 Current excise system for cigarettes in China

Level	Type of excise	Producer price range	Current excise rates
Producer level	Specific (all classes)	All packs	0.06 RMB/pack
	Ad valorem (class I)	>10 RMB/pack	56%
	Ad valorem (class II)	7–10 RMB/pack	56%
	Ad valorem (class III)	3–7 RMB/pack	36%
	Ad valorem (class IV)	1.65–3 RMB/pack	36%
	Ad valorem (class V)	<1.65 RMB/pack	36%
Wholesale level	Specific (all classes)	All packs	0.10 RMB/pack
	Ad valorem (all classes)	All packs	11%

Notes: (1) ad valorem rates are applied to the respective producer and wholesale price of each brand and (2) one pack contains 20 sticks.

of specific rates given that low prices can encourage smoking among those with lower disposable incomes such as youth and the poor. However, this feature can be mitigated to some extent by tobacco industry pricing strategies. In 2015, for example, China's tobacco industry absorbed some of the Government's tax increase into its own wholesale profit margins.[13] Nonetheless, it is widely expected that significantly higher specific taxes will ultimately be passed onto consumers in the form of higher prices, and this is the assumption applied to taxes and prices in the model over 2017–2030.

FINDINGS

Table 3 shows the baseline estimate for 2016 together with the prediction for 2030 under the business as usual scenario. The baseline includes the CDC finding that 27.7% of adults smoke in China.[2] The volume of cigarette sales was reported at 117 billion packs per annum, with these sales generating excise revenue totalling around RMB 520 billion.[10 13]

Under the business as usual scenario, it is predicted that the average retail price of cigarettes will increase by 10% in real (constant 2016 price) terms. The share of excise in the retail price falls marginally reflecting, in part, the assumption under this scenario that specific excise is not increased over time. The rate of smoking is predicted to decrease by 1.2% from 27.7% to 26.6% (25.6%~27.6%) by 2030. The direction for prevalence under this scenario is broadly consistent with a recent study by WHO, which uses Bayesian meta-regression trend analysis to project that the rate of smoking in China will decrease by 1.8% between 2015 and 2025.[28]

The number of smokers in China remains at around current levels due to adult population growth, while cigarette sales increase to about 145 billion packs per annum by 2030. Cigarette sales are thus predicted to increases by 1.5% per annum over 2017–2030, which is about the same level of annual growth recorded over the past decade.[10] Total excise revenue from cigarettes increases by about 32% in real terms but decreases as a

proportion of Gross Domestic Product (GDP) from 1.13% in 2016 to 0.71% in 2030.

Table 4 shows the models prediction for the non-price measures scenario through to 2030, with cigarette taxes and prices being the same as the business as usual scenario. If China fully implements the non-price measures in MPOWER by 2030, it is predicted that the rate of smoking will decrease to 22.0% (20.9%~23.1%). This constitutes a relative reduction of 17.4% (13.3%~21.5%) in the rate of smoking by 2030 compared with the business as usual scenario. However, even under more optimistic assumptions, the rate of smoking still only falls to 20.9% suggesting that non-price measures alone are unlikely to achieve the Healthy China 2030 target of 20% smoking prevalence.

Annual cigarette sales decrease to about 94 billion packs in 2030 representing a combination of lower prevalence and reduced smoking intensity under the non-price measures scenario. Real excise revenue from cigarettes is predicted to decrease to about RMB 447 billion by 2030, a reduction of −14% (−25%~−3%) compared with the 2016 baseline. This highlights the fiscal importance of raising tobacco taxes, especially in the presence of other tobacco control measures that reduce the aggregate demand for tobacco. Indeed, excise revenue from cigarettes is predicted to decrease from 1.13% to about 0.46% of GDP under this scenario.

Table 5 shows the predicted impact of the implementing all tobacco control measures including tobacco taxation. Under this scenario, the specific rate on wholesalers is raised from 0.1 to about 3.3 RMB/pack in real terms by 2030, and the share of excise in the retail price is predicted to increase from 34.5% in 2016 to 44.0% in 2030.

The rate of smoking is then predicted to decrease to 19.7% (18.2%~21.3%), representing 78 million (59~97 million) fewer smokers compared with 2016. Note this constitutes a relative reduction of 25.8% (19.8%~31.6%) in the rate of smoking by 2030 compared with the business as usual scenario. Cigarette consumption decreases to 75 billion (60~90 billion) packs per annum in 2030, representing a decrease of 37% (23%~49%) compared with 2016.

Real excise revenue from cigarettes increases to around RMB 633 billion (507~768 billion) in 2030, representing 21% (−3%~47%) more excise revenue compared with the 2016 baseline. This is a notable change compared with the non-price measures scenario where there was a clear decrease in real excise revenue. Excise revenue as a share of GDP is also higher at 0.61% in 2030 compared with 0.46% under the non-price scenario.

Indeed, real excise revenue under the all tobacco measures scenario is similar to the business as usual scenario, though with the 'pay-off' being in terms of achieving the Healthy China 2030 target. Overall, there would be 84 million (64~103 million) fewer adult smokers compared with the business as usual scenario by 2030. In addition, even higher tax rates and/or tax

Table 3 Business as usual scenario (no new or additional measures)

	Real price (RMB/20)	Excise share (% price)	Smoking rate (%)	Adult smokers (million)	Cigarette packs (billion)	Real excise revenue (billion RMB)
2016 estimate	12.8	34.5	27.7	320	117	521
2030 prediction	14.2 (14.1~14.3)	33.5 (33~34)	26.6 (25.6~27.6)	325 (313~338)	145 (143~146)	687 (683~692)
Absolute change	1.3 (1.2~1.4)	−1 (−1~−1)	−1.2 (−2.2~−0.1)	6 (−7~20)	27 (26~29)	166 (162~171)
Relative change	10 (9~11)	−3 (−3~−3)	−4 (−8~−0)	2 (−2~6)	23 (22~24)	32 (31~33)

Note: US$1=6.64 RMB.

Table 4 Impact of non-price tobacco control measures

	Real price (RMB/20)	Excise share (% price)	Smoking rate (%)	Adult smokers (million)	Cigarette packs (billion)	Real excise revenue (billion RMB)
2016 estimate	12.8	34.5	27.7	320	117	521
2030 prediction	14.2 (14.1~14.3)	33.5 (33~34)	22.0 (20.9~23.1)	268 (255~282)	94 (83~106)	447 (392~505)
Absolute change	1.3 (1.2~1.4)	−1 (−1~−1)	−5.8 (−6.9~−4.7)	−51 (−64~−38)	−23 (−35~−11)	−74 (−129~−16)
Relative change	10 (9~11)	−3 (−3~−3)	−21 (−25~−17)	−16 (−20~−12)	−20 (−30~−10)	−14 (−25~−3)

Note: US$1=6.64 RMB.

Table 5 Impact of all tobacco control measures including taxation

	Real price (RMB/20)	Excise share (% price)	Smoking rate (%)	Adult smokers (million)	Cigarette packs (billion)	Real excise revenue (billion RMB)
2016 estimate	12.8	34.5	27.7	320	117	521
2030 prediction	19.3 (19.3~19.3)	44.0 (43~45)	19.7 (18.2~21.3)	241 (222~261)	75 (60~90)	633 (507~768)
Absolute change	6.4 (6.4~6.4)	10 (9~11)	−8.0 (−9.6~−6.4)	−78 (−97~−59)	−43 (−58~−27)	112 (−14~247)
Relative change	50 (50~50)	28 (27~29)	−29 (−34~−23)	−25 (−30~−18)	−37 (−49~−23)	21 (−3~47)

Note: US$1=6.64 RMB.

reform may generate more excise revenue while acting to further supress demand.

DISCUSSION

This study shows that the non-price tobacco control measures in WHO's MPOWER package can make a significant contribution to reduced smoking in China. In particular, smoke-free policies are the least implemented measure nationally. Our modelling suggests that smoke-free policies alone could reduce the rate of smoking by 2.7% (2.0%~3.3%) in 2030, representing around 33 million (24~41 million) fewer smokers in China compared with a business as usual scenario.

A limitation of this study, however, is that it does not include potential constraints to full implementation of the MPOWER measures in China, including the need for enforcement. For example, it may be challenging to enforce smoke-free policies particularly in more remote rural areas. This re-enforces the message that non-price measures alone are unlikely to achieve the Healthy China 2030 target. Indeed, tax and price measures have the additional benefit of being able to reach all populations regardless of how isolated they might be.

Another limitation is that the model does not include the impact of past policies or the possible synergistic impact of implementing all policies together. These limitations are acknowledged, though China is starting from a low baseline level of implementation. We also take a conservative modelling approach by including only the marginal or additional effect of fully implementing existing or new tobacco control measures. The size effects are also applied as constant relative reductions so that we do not overstate the impact of implementing multiple measures. However, there could be a synergistic impact from implementing all of these measures over the same short time-frame. For example, all of these measures together should help to 'denormalise' tobacco use thus reducing overall demand for tobacco.

More generally, it is clear that significantly higher tobacco taxes will be needed to achieve the Healthy China 2030 target for reduced smoking. In addition, this study highlights the fiscal importance of raising tobacco taxes in the presence of other tobacco control measures that will tend to reduce aggregate demand. The public health and fiscal objectives of raising tobacco taxes are thus closely aligned and internally consistent, even under conditions of quite strong demand reduction.

In practical terms, this study does not address the strong political commitment needed to implement tobacco control in China. The Healthy China 2030 strategy is an important benchmark in this respect, but policy-makers will need to overcome heavy tobacco industry resistance. The creation of a new health commission to oversee tobacco control regulations is another important development, and it will be important that this commission has input as a stakeholder into tobacco tax policy. The government may also need to consider supply-side strategies

What this paper adds

What is already known on this subject
► China has made progress on tobacco control in recent years, with latest measures including subnational bans on smoking in public places in a number of cities including Beijing as well as the national tobacco tax increase in 2015. In October 2016, President Xi Jinping announced the 'Healthy China 2030 Blueprint', a national strategy that sets ambitious targets for China, including a decrease in the rate of smoking to 20% by 2030.

What important gaps in knowledge exist on this topic
► In response, China's policy-makers will need to accelerate the implementation of key tobacco control measures such as outlined in the WHO MPOWER package. However, will these measures be enough to achieve the targeted reduction in smoking, and what contribution might be required from the different price and non-price interventions?

What this paper adds
► This study takes and adapts effect sizes from the literature to predict the impact of fully implementing tobacco control measures that are currently underused in China. The study finds that significantly higher tobacco excise taxes will be needed to achieve the Healthy China 2030 target for reduced smoking even after implementing other tobacco control measures.

such as short-term support or assistance to farmers potentially affected by the scale-up of tobacco control.

CONCLUSION

The new Healthy China 2030 strategy sets ambitious targets for policy-makers to achieve, including a reduction in the rate of smoking to 20% by 2030. Non-price tobacco control measures such as smoke-free policies can make a significant contribution. However, non-price measures alone are unlikely to achieve the Healthy China 2030 target. Tobacco taxation should be part of any comprehensive national tobacco control strategy, and this study finds that significantly higher tobacco taxes will be needed in China to achieve the target for reduced smoking, even after implementing other non-price tobacco control measures.

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