A financial case to enable state health jurisdictions to invest in tobacco control

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ABSTRACT

- State health departments bear considerable expenditure due to tobacco-related hospitalisations.
- We present a straightforward formula, based on aetiological fractions (attributable risks), with which to estimate tobacco-related expenditure in a way relevant and meaningful to state health departments and hospital managers.
- Tobacco was responsible for 43 350 hospitalisations in New South Wales in 1999–2000 alone, incurring $176 096 323 in hospital costs (nearly $482 456 per day).
- If the equivalent of a specified percentage of expenditure as calculated for one year were "invested" in tobacco control in the next year, then commitments to a substantive suite of health promotion programs could be made. For example, using our formula, a contribution of 3% would secure an annual tobacco control budget of $5 282 890 in NSW.
- Once securely funded, evidence-based tobacco control would reap dividends by reducing hospital expenditure and enhancing population health.

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THERE IS UNIVERSAL CONSENSUS about the risks for ill health and premature death attributable to tobacco. In Australia, in 1996, cigarette smoking was responsible for the loss of about 227 000 disability-adjusted life-years (DALYs).[1] Worldwide, tobacco causes about 8.8% of deaths and 4.1% of DALYs.[2] By 2020, the disease burden attributable to tobacco will have doubled.[2] Yet a 25% reduction in smoking would result in 17 million fewer DALYs in 2010 and 22 million fewer in 2020.[2] Nonetheless, criticism from the World Health Organization continues — that most services, resources and research in healthcare focus on the treatment of tobacco-related disease, rather than its prevention.[2]

Unlike preventive approaches for other public health issues, for which the evidence may be less compelling or the dividend from health promotion interventions less scientifically defensible, tobacco control represents an uncontroversial investment in population health. There is compelling evidence of both short-term and long-term health benefits from tobacco control.[3-7] Furthermore, there is national consensus about health promotion programs that are effective in reducing tobacco use,[8-11] as well as a priority-driven research agenda to furnish interventional evidence in gaps most immediately relevant to policy and practice.[12]

Problem: who will pay?

In Australia, bureaucratic responsibility for evidence-based tobacco control is unclear in the existing legislative arrangements between Commonwealth and state (including territory) health jurisdictions.[8] State health jurisdictions carry primary responsibility for in-patient hospital services and directly bear the financial burden of hospitalisations,[13] including "avoidable" admissions.[14] By contrast, the Commonwealth directly funds general practice and other fee-for-service professionals, and specific public health programs.[13] Within these financial arrangements, there is no clear delegation of accountability for tobacco control. Hence, the necessary coalition of government interests to reduce tobacco use appears split counterproductively between jurisdictions. Commentators outside the healthcare system have criticised the paucity of government expenditure on tobacco control in any jurisdiction.[15,16]

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Smokers use inpatient hospital services more than people who have never smoked.[17-19] Smokers are also more likely than non-smokers to use services such as emergency and outpatient departments,[19] to heal less quickly[20] and to be admitted after surgical procedures to intensive care.[21] As these costs are met by state jurisdictions, the states are likely to benefit most from tobacco control through reduction of hospitalisations. We hypothesised that hospital managers in state jurisdictions have yet to be presented with a coherent "business case" for tobacco control.

Proposed solution: the "business case"

Here, we show how to calculate specific expenditure incurred through hospitalisations directly attributable to tobacco. If it were agreed to "invest" the equivalent of a specified percentage of this expenditure in evidence-based tobacco control, then commitments to a substantial suite of health promotion programs could be made. Investment in tobacco control is likely to reduce demand for hospitals, thereby decreasing healthcare costs, and enhance population health.

We first referred to available data sources to determine a list of conditions for which there is clear and quantified evidence of causation by tobacco. Specifically, aetiological fractions were originally published by English in 1995[22] and recently updated by Ridolfo and Stevenson.[23] The *aetiologi-*

1: Aetiological fractions for tobacco-related diseases[23]

Principal diagnosis, age (years)	ICD-9 codes	Aetiological fractions	
		Men	Women
Cancer			
Anal cancer, ⩾35	154.2, 154.3	0.347	0.258
Bladder cancer, ⩾35	188	0.296	0.215
Laryngeal cancer, ⩾35	161	0.613	0.508
Lung cancer, ⩾35	162	0.903	0.646
Oesophageal cancer, ⩾35	150	0.423	0.324
Oropharyngeal cancer, ⩾35	141, 143–146, 148–149	0.464	0.361
Pancreatic cancer, ⩾35	157	0.173	0.12
Penile cancer, ⩾35	187.1–187.4	0.163	—
Renal parenchymal cancer, ⩾35	189	0.135	0.092
Renal pelvic cancer, ⩾35	189.1	0.419	0.32
Respiratory carcinoma in situ, ⩾35	231	0.903	0.646
Stomach cancer, ⩾35	151	0.091	0.061
Vulvar cancer, ⩾35	184.4	—	0.278
Chronic obstructive pulmonary disease			
Chronic obstructive pulmonary disease, ⩾35	490–492, 496	0.682	0.583
Ischaemic heart disease			
Ischaemic heart disease, <65	410–414	0.358	0.331
Ischaemic heart disease, ⩾65	410–414	0.088	0.059
Other direct effects of smoking			
Antepartum haemorrhage	640, 641, 762.0, 762.1	—	0.148
Atherosclerosis, ⩾18	440–448	0.257	0.232
Cardiac dysrhythmias, <65	427	0.358	0.331
Cardiac dysrhythmias, ⩾65	427	0.088	0.027
Crohn's disease, ⩾18	555	0.168	0.317
Ectopic pregnancy, ⩾18	633, 761.4	—	0.108
Heart failure, <65*	428–429	0.358	0.331
Heart failure, ⩾65*	428–429	0.088	0.027
Low birthweight	656.5, 764, 765	0.225	0.225
Peptic ulcer, ⩾20	531–534	0.09	0.056
Pneumonia, ⩾18	480–487	0.108	0.092
Premature rupture of membranes	658.1, 658.2, 761.1	0.206	0.206
Pulmonary circulation disease, ⩾35	415.0, 416–417	0.682	0.583
SIDS and smoking during pregnancy	798	0.329	0.329
Spontaneous abortion	634, 761.8	—	0.091
Stroke, <65	430–438	0.373	0.344
Stroke, ⩾65	430–438	0.086	0.058
Tobacco misuse	305.1	1	1

*Proportion of heart failure cases associated with ischaemic heart disease.
— = Not applicable.

cal fraction, also known as *attributable risk* or *attributable fraction*, is a recognised calculation quantifying morbidity and mortality due to a specified risk factor.[23] It is the proportion of cases to have been caused directly by exposure to this specific risk factor.[22] Furthermore, these cases occur only because of this exposure.[22] Box 1 shows aetiological fractions by age and sex for 30 tobacco-attributed diseases in four broad categories: cancer, ischaemic heart disease, chronic obstructive pulmonary disease, and others. Almost all cases (90%) of lung cancer in men and nearly two-thirds (65%) in women are directly attributable to personal tobacco use (Box 1). Because of unresolved epidemiological uncertainty,[22,23] we did not include passive smoking and fire injuries. Hence, Box 1 is a conservative list of tobacco-related conditions.

By using these aetiological fractions, the proportion of hospital admissions for these 30 conditions attributable to tobacco can be calculated. Through the Health Outcomes Information and Statistical Toolkit,[24] we obtained the most recent hospital separation data and average length of stay (hospital bed-days) data for a 12-month period (1999–2000 financial year) from the New South Wales Inpatient Statistics Collection (ISC). ISC is a census for admissions to all services provided by public hospitals, public psychiatric hospitals, public multipurpose services, private hospitals and private day-procedure centres.[24] Hospital separations are coded according to one principal diagnosis. We used ISC data to calculate the total number of hospital separations and the average length of stay by sex for each of the diseases listed in Box 1. Hospitalisations directly attributable to smoking were calculated by multiplying the sex and age-specific hospital separations for each disease by the relevant attributable fraction. Smoking-attributable hospital bed-days for each disease were calculated by multiplying the number of hospital separations attributable to tobacco for this disease by the relevant average length of stay. Hospital costs of smoking-attributable hospitalisations for patients admitted to hospital in the 12-month period were estimated by multiplying published amounts for average bed-day cost[25,26] by totals of smoking-attributable bed-days. Our statistical program is available on request.

Armed with these estimates, a persuasive argument can be mounted to invest in tobacco control to reduce hospital costs. More particularly, the amounts to be dedicated to tobacco control could be calculated on the basis of an objective determination of tobacco-related costs. Indeed, health service managers could be asked to nominate *a priori* the proportion of hospital costs they would consider appropriate to levy in their setting to reduce demand. Our initial consultations with senior executives in the Division of Population Health obtained responses ranging from 5% to 10%. A value of 3% is consistent with productivity savings typically required of public-sector agencies.

Case studies

State example

To demonstrate relevance for state health jurisdictions, we selected New South Wales as an example. As calculated for

2: Proportion of tobacco-attributable hospital separations and number of hospital bed-days, NSW and South Western Sydney, by sex 1999–2000

Reason for separation	NSW hospital separation		NSW hospital bed-days		SWS hospital separations		SWS bed-days	
	Male	Female	Male	Female	Male	Female	Male	Female
Cancer	19%	15%	39 584	19 265	23%	15%	5 074	1 992
Ischaemic heart disease	27%	14%	31 778	8 651	29%	16%	3 584	1 027
Chronic obstructive pulmonary disease	25%	29%	56 326	37 144	22%	25%	5 542	3 137
Other	28%	43%	61 128	46 168	26%	44%	6 772	4 708
Total numbers	28 162	15 409	188 817	111 229	2 880	1 572	20 972	10 864

SWS = South Western Sydney.

the 1999–2000 financial year, tobacco directly contributed to an estimated 43350 hospitalisations in NSW (Box 2), constituting 3.1% and 1.5% of all hospitalisations for men and women, respectively. Tobacco-attributed hospitalisations accounted for 295 960 hospital bed-days, representing 3.5% of all bed-days in NSW (total, 8 337 286 bed-days). As the average bed-day cost in NSW hospitals for that period was reported as $595 per day,[25] tobacco-attributed hospitalisation cost $176 096 323 in that 1 year alone ($482 456 every day).

Box 2 also displays the proportions of hospital separations and number of hospital bed-days due to tobacco-related diseases by sex for the 1999–2000 financial year. In NSW, major contributors to tobacco-related hospitalisations for men included ischaemic heart disease (28%) and cancer (20%). For women, the major contributor to tobacco-related hospitalisations was chronic obstructive pulmonary disease (29%). Lung cancer contributed to 4027 (2961 men; 1067 women) hospital separations attributed to tobacco use. This represented 54% and 47% of the cancer-related hospitalisations attributed to tobacco use in men and women, respectively.

A proportional levy of 3%, as would be typically imposed upon public-sector organisations as an annual productivity saving, would secure an annual budget of $5 282 890 for NSW. Five per cent would secure an annual budget of nearly $8 804 816.

Regional example

As our approach also could be relevant at a regional level, we selected South Western Sydney (SWS) on the basis of unmet health need and high smoking rates.[24] We estimate there were 4452 hospitalisations attributable to tobacco use in hospital facilities located in SWS and managed by South Western Sydney Area Health Service (SWSAHS) in the 1999–2000 financial year, representing 3% of all hospitalisations for men and 1.5% of all hospitalisations for women (Box 2). Furthermore, tobacco-related hospitalisations accounted for 31 836 hospital bed-days (4% of all hospital bed-days in SWSAHS). The average cost of one hospital bed-day in SWSAHS in 1999–2000 was reported as $764.[26] Hence, tobacco-related diseases cost SWSAHS an estimated $24 322 704 in that year. Furthermore, there were 87 hospitalisations on average in SWSAHS every day in 1999–2000 for tobacco-related diseases, costing SWSAHS just over $66 000 per day. This daily expenditure equals the typical annual gross salary for one experienced Senior Health Education Officer (Health Education Officer Determination: Health and Research Employees Association Award).

In SWSAHS, major reasons for tobacco-related hospitalisation among men included ischaemic heart disease (29%) and cancer (23%) (Box 2). Chronic obstructive pulmonary disease contributed to 25% of tobacco-attributed hospital separations among women (Box 2). Five hundred and fifty-four separations for lung cancer (413 men; 141 women) were directly attributable to tobacco. Furthermore, men and women in SWS had significantly higher hospitalisations for lung cancer compared with men and women in NSW overall (men: OR, 1.4; 95% CI, 1.27–1.59; women: OR, 1.25; 95% CI, 1.03–1.15). A proportional levy of 3% would secure an annual budget for SWSAHS of $729 681 for tobacco control. Five per cent would secure an annual budget of nearly 1 million dollars.

Reflections

We attempted to develop a fiduciary rationale immediately salient to people struggling with hospital over-expenditure, thereby addressing any perceived impasse working against substantial investment in tobacco control. The method allows health managers to estimate the direct costs to their organisations caused by tobacco use, and so highlight the savings they could realise by investing in tobacco control.

As proposed here, our method can be criticised. For example, taxes already are levied on the tobacco industry, although these are inconsistently allocated to health promotion by state jurisdictions.[27] Furthermore, aetiological fractions are a function of the relative risks associated with the disease in question and the population prevalence. Hence, significant variation in smoking prevalence should be factored into subsequent applications of our method. Time lags between tobacco exposure and disease will determine the realisation of benefit from an investment in tobacco control. Given the lead-time between the act of smoking and the onset of disease, policy makers who move funds to tobacco control will not see all returns from this investment in terms of fewer hospitalisations, and hence lower hospital costs, in the short term. However, epidemiological sources used by us[23] addressed prevalence estimates and time lag.

Could our method be applied to other public health issues? Theoretically, this is possible, but could transgress the diligence required of an evidence-based approach. Spe-

cifically, tobacco control meets two fundamental criteria characteristic of evidence-based healthcare. First, the causal pathway between tobacco and subsequent disease has been convincingly established. There is no speculation about the validity of aetiological fractions due to direct tobacco use. Second, there is a clear body of evidence demonstrating the effect of health promotion interventions encompassing prevention, legislation and cessation, although dimensions of equity and, particularly, differential impact of such interventions by socioeconomic class remain poorly understood. Where effectiveness is not yet proven, a responsive research agenda for tobacco control has been proposed.[8,9] In other aspects of population health, either or both of these criteria are not yet met. In obesity, for example, the portfolio of effective interventions is yet to be defined. With respect to emerging techniques for population-based screening, governments do not advocate screening in the absence of compelling evidence. In such situations, determination of a budget for promotional activities would be premature. By contrast, many government policies contain positive political commitment to tobacco control.[9,10,28]

Our approach has revealed how much is spent on tobacco-related hospitalisations. Healthcare costs will increase unabated unless persuasive arguments can be mounted to secure sustainable budgets for evidence-based prevention. As pressures to reconsider health priorities confront all governments, senior executives, clinicians and consumers,[29] our novel yet methodologically defensible argument appears accessible to a wide audience.

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Competing interests

None identified.

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