Abstract

The paper aims to clarify a legislation procedure in tobacco smoking social policy formulation in Australia, non governmental organisations’ (NGOs) influence to initiate change of tobacco control enforcement, and measures undertaken to prevent smoking among adolescents in the Australian States and National Territories. The paper is based on the recent research project conducted about public policy role in controlling and preventing the use of tobacco products among adolescents in Australia. The research project is an extent of the authors’ previous study (Coghill & Petrovic-Lazarevic, 2002; Petrovic-Lazarevic, Abraham & Coghill, 2004) to identify the factors affecting the effectiveness of measures to prevent tobacco smoking by people under 18 years in six municipalities in the Australian State of Victoria.

In order to prevent and control smoking, the Australian Federal Government’s involvement in the process of legislating control of tobacco usage relates to cigarettes’ advertisement and enforcement of selling cigarettes to under age persons. The States and the National Territories’ jurisdiction, however, is concentrated to regulations relevant to smoke-free environments, monitoring tobacco smoking enforcement, and providing education among youngsters on negative health effects of smoking. Local governments, on the other hand, do not have power to make by-tobacco related laws in each State/National Territory.

The research findings point to insignificant differences in the States and National Territories’ legislation procedures with no indication of paying specific attention to prevent smoking among juveniles. In addition, in each States and National Territory decision support systems were unused and unknown.

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TOBACCO SMOKING POLICY PROCESSES IN AUSTRALIAN STATES AND TERRITORIES

INTRODUCTION

Attempts to control tobacco usage are part of the contemporary political agenda in many countries including Australia (Studlar, 2002). Tobacco smoking is the largest single preventable cause of death in Australia (QUIT, February 2004). It is estimated that every year 19,000 Australians die from smoking–related illnesses (QUIT, February 2004). Most smokers are recruited as juveniles. Once started, they become highly addicted to it (QUIT, March 2004). Eight out of ten new smokers are children or adolescents. “Early uptake of smoking is associated with heavier smoking patterns, a lesser likelihood of quitting, and a higher probability of becoming ill from a smoking related disease” (ARC, 2004).

Tobacco smoking is associated with addiction to the nicotine content of cigarette smoke. Addiction to cigarettes commences as an uninformed and irrational action. Smoking by adolescents is related to emulating adult roles and is a symbol of belonging (Bachman, Wadsworth, O’Malley, Lloyd & Scholenberg; 1997). Ill-health effects are too remote to be of concern (Winstanley, Woodward, & Walker; 1995). Recruitment of minors as smokers is different from the “rational addiction” of established adult smokers, and decisions by adults to continue or cease smoking (Becker & Murphy, 1988). Early commencement of smoking is closely linked to both long-term smoking and heavy smoking (Tutt, Lyndon, Edwardsand & Cook; 2000). Access to cigarettes is a major factor in the high levels of smoking among minors (Winstanley, et al; 1995).

The extent of social regulation of the community has effects in the particular instance of the regulation of access by minors to cigarettes in pursuit of the societal objective, expressed as public policy, of reduced incidence of smoking related ill-health and premature death, has been studied. The public policy lends itself to study as there has been considerable attention to the issue for at least two decades in several jurisdictions, with a variety of specific policy measures and a range in the enforcement effort applied and compliance levels achieved. This has been extensively reported in the literature, including changes over time following the amendment of public policy and its enforcement (Coghill & Petrovic-Lazarevic; 2002).

Government regulation of smoking involves three methods, collectively covering three principal concerns: health of smokers, structure of tobacco industry, rights of non-smokers (McGowan, 1995; Nathanson, 1999). Governments, supported by medical evidence, antismoking social movements and interests groups, are increasing their activities on both regulations and taxes (Tate, 1999) imposing “legislative, executive and judicial policy activity concerning tobacco control” (Studlar, 2002).

Development of any government policy, including tobacco smoking control policy, observed as a decision making process, is primarily supported by supplying data and information to decision makers (Carlson, Fedrizzi, & Fuller; 2004). Decision support systems are little used in developing government regulations (Turban &Aronson; 2001). According to a literature review, decision support systems have been implemented in a form of neuro-fuzzy systems in energy policy planning (Gugor & Arikan; 2000), security policies (Hosmer, 1992) and health policy (Kroneman & Van der Zee: 1997). It seems there is no, however, literature evidence of using decision support systems in government social policy regulations, apart of the research undertaken by Coghill and Petrovic-Lazarevic (2002) and Petrovic-Lazarevic, Abraham and Coghill (2004), to identify the factors affecting the effectiveness of measures to prevent tobacco smoking by people under 18 years in six municipalities of the Australian state Victoria.

The paper is important in that it identifies where is the pitfall in tobacco control social policy formulation related to adolescents in Australia. The paper is organised as follows: After introduction, an explanation of research methodology is presented. Part three points to the project
findings. Part four discusses the project findings. Paper ends with concluding remarks and future research interests.

RESEARCH METHODOLOGY

The research project was conducted based on semi structured interviews with a senior official authorised by the Health Department of each Australian State and National Territory Government. The Health Department of all States and National Territories is the primary agency that coordinates smoking prevention activities including social research and formulation of legislation (See Table 1). All interviews were carried over the phone, except Victoria State where the interview was conducted face-to-face. Each interview lasted approximately one hour.

Prior to the interview the interviewee was provided with the research project explanatory statement and research consent form. After receiving research consent form signed and approved by interviewee, the interviewer was able to conduct the interview. Interviews were tape recorded and transcribed into case studies.

Semi structured questionnaire consisted of the following parts:

- Explain the procedure to collect and process information relevant to the change of existing tobacco control legislation or introducing new tobacco control enforcement?
- What is the role of NGOs in this process?
- What is the procedure to monitor tobacco control legislation?
- How are juveniles included in the tobacco smoking legislation?
- Decision support system use in the legislation procedure.

Table 1: State and National Territory Government Departments and Divisions Responsible for Tobacco Smoking Control and Prevention

<table>
<thead>
<tr>
<th>State/Territory</th>
<th>Department</th>
<th>Special Centre/Division</th>
</tr>
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<tbody>
<tr>
<td>Australian Capital Territory</td>
<td>Australian Capital Territory Health Department</td>
<td>Health and Protection Service and Drug Policy Section</td>
</tr>
<tr>
<td>New South Wales</td>
<td>New South Wales Health Department</td>
<td>Tobacco and Health Branch: Centre for Chronic Disease Prevention and Health Advancement</td>
</tr>
<tr>
<td>Northern Territory</td>
<td>Department of Health and Community Services</td>
<td>Tobacco Action Project</td>
</tr>
<tr>
<td>Queensland</td>
<td>Queensland Health</td>
<td>N/A</td>
</tr>
<tr>
<td>South Australia</td>
<td>Department of Health</td>
<td>Tobacco Control Unit</td>
</tr>
<tr>
<td>Tasmania</td>
<td>Department of Health and Human Services</td>
<td>Tobacco Coalition</td>
</tr>
<tr>
<td>Victoria</td>
<td>Department of Human Services</td>
<td>Alcohol, Tobacco and Koori Drug Policy Unit</td>
</tr>
<tr>
<td>Western Australia</td>
<td>Department of Health</td>
<td>N/A</td>
</tr>
</tbody>
</table>

FINDINGS

Based on the semi structured questionnaires the research findings presented in the Table 2 are grouped as follows: legislation procedure in Australian States and the National Territories, role of
NGOs in the legislation procedure, monitoring of legislation, legislation related to juveniles and decision support system use in the legislation procedure.

Legislation Procedure in Australian States and the National Territories

The Australian Federal Government is responsible for legal regulation of advertising and promoting tobacco products and selling cigarettes to minors. The States and the National Territories' Governments are entitled to change laws relevant to smoke-free environments. They are responsible for monitoring tobacco smoking enforcement, and providing education programs on tobacco smoking health effects.

In all Australian States and National Territories the procedure to collect and process information relevant to the change of an existing legislation or introducing a new legislation for smoking prevention and tobacco smoking control is similar.

The initiative to change legislation at State/National Territory level can come from different sources: public pressure, State/National Territory Government, NGOs, as a recommendation through national level, new evidence facing the dangers of passive smoking, researchers in Federal Government who work on different aspects of tobacco control and policy officers.

The initiation can also come directly from the State/National Territory Health Minister. The Health Minister is entitled to make changes without consultation that will then become law.

The Minister receives a number of submissions from different sources: Hospitality Industry, Tobacco Retailing Industry, Health Organisations, and Unions. These submissions are made by diverse groups who lobby the Minister. In such cases the Minister usually addresses to the Department of Health requesting to further explore the possibility of introducing the new legislation or changing the existing one. In some States/National Territories, however, the Minister goes to a specified agency in the Department of Health responsible for coordinating the whole process and bringing together information from a variety of sources before the legislation is put to Parliament. For example, in the Northern Territory this agency is the Tobacco Action Project, and in South Australia it is The Tobacco Control Unit (See Table 1).

In each State/National Territory the Department of Health has to constantly review the current legislations and programs and their effectiveness every fourth year. The Department conducts a review that includes public discussion through ballot papers where people put their ideas. The Health Department representatives usually do not speak to the people directly. The exemption is the Northern Territory where the Department representatives consult the 16 indigenous remote communities. For such consultations they spend a few days with each individual community.

If a recommendation for the legislation change is initiated by the Department of Health, it must follow a legal hierarchy. That is, it first goes to the Minister who decides whether to proceed with a recommendation or not. If the Minister accepts the recommendation, then it goes to the Cabinet. The whole process can last long depending on the Minister and State Government in charge. It can start all over again after elections when a new State Government and a Health Minister have been elected.

The Cabinet approves the drafting of the Bill and recommendations. The Minister authorises the drafting of amendments, which then may go public. Public consultation is sought on the proposed legislation through advertisements in the newspapers. For example, for changes proposed for the smoking in hospitals in South Australia the Health Department Tobacco Control Unit has received 483 submissions.

An interesting case is the Queensland Government that has recently reviewed the Tobacco Smoking Legislature Act 1998. The Health Department has created a discussion paper and released it to the general public and the following stakeholders: Hospitality Industry, Tobacco
Retailing Industry, Health Organisations and Unions. In addition to this paper a booklet was written and a web site provided. More than 1,300 submissions from the community and stakeholders were received and analysed. Then the policy submission was written to the Health Minister. After the approval by the Health Minister, the Bill was drafted and the Cabinet submission for the policy was made. The Cabinet requested that a couple of issues be reviewed, and needed more relevant information. After three submissions to the Cabinet in total, the policy: Tobacco and Other Smoking Products Acts in Queensland was finalised. The Bill was taken to Parliament and debated in the House of Assembly. It was accepted with one amendment.

The drafting of amendments in every State/National Territory includes going to other departments in order to receive comments from business, financial, equity and social justice points of view. In Victoria, for example, it goes to all departments including the Justice Department and Social Services Department.

Local Governments in each State/National Territory are entitled to impose tobacco control enforcement for issues that are not covered by the State/National Territory Tobacco Act. For example, the central city council of Melbourne in Victoria has enforced the use of cigarette but litters, as it was not covered by the Tobacco Act of Victoria. Some Melbourne city municipalities have also introduced a smoking ban for beaches.

Role of NGOs in the legislation procedure

Recognised NGOs or interested parties in the tobacco control legislation can be divided in two groups, as presented in Table 3.

**Table 3: NGOs involved in the Tobacco Control Legislation Procedure**

<table>
<thead>
<tr>
<th>Health Group</th>
<th>Industry Group</th>
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<tbody>
<tr>
<td>Action on Smoking and Health Australia</td>
<td>Tobacco Industry</td>
</tr>
<tr>
<td>Asthma Association</td>
<td>Hospitality Industry</td>
</tr>
<tr>
<td>Cancer Council</td>
<td>Tobacco Retailing Industry</td>
</tr>
<tr>
<td>General Public</td>
<td>Businesses associated with gambling</td>
</tr>
<tr>
<td>Heart Foundation</td>
<td>Clubs Australian Capital Territory</td>
</tr>
<tr>
<td>Works Unions</td>
<td></td>
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<tr>
<td>Sydney Free Coalition</td>
<td></td>
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<tr>
<td>QUIT</td>
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<tr>
<td>Smoke-Free Tasmania</td>
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</table>

In the Australian Capital Territory most interested parties are inactive except the Sydney Free Coalition that sends its representatives to Canberra when there is a need for advocacy. In terms of influencing tobacco policy from the economic point of view, the Australian Hotel Association and Clubs Australian Capital Territory are quite active. One of the most effective things that these groups do is to seek personal meetings with the Minister and other members of the Assembly.

The New South Wales Department of Health has very good relationships with external agencies. They work together on a number of issues including tobacco control. The Department jointly funds a Tobacco Control Network with the New South Wales Cancer Council. The agencies and the Health Department officials working on tobacco control activities across New South Wales meet twice a year. These meetings are an opportunity to exchange notes on what is happening in the tobacco control initiatives in the State. The New South Wales government has four year tobacco actions plans prepared with consultation with the Tobacco Control Network.

The Heart Foundation is the most active non governmental organisation in Northern Territory.
As in every other State/National Territory, in Queensland if an interested party wants to change a tobacco smoking related legislature it does have to approach the Department of Health or the Premier of the State. The procedure of changing legislature is a long process that usually lasts over a year.

In South Australia the agencies mostly involved in the tobacco smoking social regulation are Action on Smoking and Health Australia, Cancer Council, Heart Foundation, Asthma Foundation, and Hospitality and Tobacco Retailing Industrial Associations.

The prominent organisations in Tasmania are QUIT Tasmania, Smoke-Free Tasmania, Health Foundation, Cancer Council and the Works Unions.

The well-known interested parties in Victoria are QUIT Victoria and Cancer Council of Victoria. They are occasionally invited to do particular research on behalf of the Department of Health.

All health groups in Western Australia are powerful in contributing to changing tobacco control legislation.

Monitoring of legislation

For monitoring purposes there is in each State/National Territory a targeted enforcement activity based on Tobacco and Other Smoking Product Acts. People authorised under the Act have the power to prosecute and punish those who breach the law.

Tobacco control officers visit stores routinely and provide advice related to sales to minors. They also conduct controlled purchase operations using trained teenage volunteers and witnesses to test selling tobacco products to people less than 18 years old. Controlled purchase operations are approved activities under the Act for compliance with the law. If a retailer is found to sell cigarettes to minor, a caution is issued and evidence about the sale is referred for prosecution. In Tasmania, for example, compliances surveys are conducted by QUIT on behalf of the Health Department.

Legislation related to adolescents

Each Australian State/National Territory has some form of legislation indirectly related to juveniles.

In the Australian Capital Territory there are two types of initiatives: Policy and Legislative Campaign and Informal Campaign. In the Policy and Legislative Campaign there are two major pieces of tobacco control legislation. First is The Tobacco Act that has provisions about the way tobacco is sold, advertised and promoted. The other is The Smoke-Free Areas Act that protects non-smokers. But it also has the effect of reinforcing the social unacceptability of smoking discouraging the uptake of smoking by young people.

Although the Information and Campaign has not been extensive in the Australian Capital Territory, there have been smoking prevention initiative campaigns in the State within the last couple of years. The initiatives were modelled on Western Australia’s anti-smoking program specifically targeting young teenagers. The initiative, involving some school education material has been directed by the Health Promotion Unit in the Department.

Programs and legislative measures to prevent smoking among youngsters are the main activities related to juveniles in New South Wales. They include school based programs with Personal Development, Health and Physical Education syllabus, sales to minors, tobacco advertising and smoke-free venues. Smoking, Don’t be a Sucker is a youth program with a partnership with the Department of Education. The program is targeting year seven students.
In the Northern Territory a number of programs targeting juveniles exist to direct schools through the tobacco and health curriculum. The intention is to reduce the number of adult smokers which as an example will reduce the number of young people who smoke.

A number of provisions exist for protecting juveniles against smoking in Queensland. First, there is a Queensland State Law about selling cigarettes to people under 18 years of age. Second, Queensland has a smoke-free environment policy forbidding smoking around children’s playgrounds, in building entrances, between flags on the beach and in stadiums. The Poison program based on a healthy promotion school framework, school curriculum and the role of a school in the broader community has been introduced. The Program has been advertised on TV and in cinemas. Then, there is the Federal Government Law responsible for advertising tobacco.

In South Australia a lot of work is done at schools to increase the awareness of the harmfulness of tobacco before it becomes a habit. Programs are educative and preventive in nature. For example: School kit from 1998: The truth is there. There is also the Oxygen website as a peer support program activity on tobacco and smoking. Sport Sponsorships and cinemas are also used to convey the message to the youth.

In Tasmania the legislation that forbids selling cigarettes to juveniles of less than 18 years of age aims to restrict the availability of cigarettes to youngsters to prevent smoking. The Tasmanian Education Department coordinates and promotes educative programs for juveniles. The programs and Acts that are in place in the State are: National Legislation Chart 2004 and Public Health Act 1997. Some municipalities have introduced educational anti-smoking programs for juveniles.

The Victoria Department of Education and Training is in charge of tobacco education programs at schools in Victoria. The project aims to address managing students who smoke, smoking policies at schools and provision of education material about the harms caused by smoking at schools. The Federal Government Tobacco Act 1987 in Victoria is applied in prohibiting certain sales or promotion of tobacco products, and to establish the Victorian Health Promotion Foundation.

In Western Australia the tobacco smoking legislation is not specifically related to juveniles. It is, however, indirectly related through alcohol and drug education programs and police programs at schools.

**Decision support system used in legislation procedure**

Two types of computing models, fuzzy control model and neuro-fuzzy models, and evolutionary algorithms as adaptive computational techniques have been applied as a support of the Australian state Victoria tobacco smoking policy regulations (Coghill & Petrovic-Lazarevic, 2002; Petrovic-Lazarevic et al, 2004). The models were used to identify the factors affecting the effectiveness of measures to prevent tobacco smoking by people under 18 years in six Victorian municipalities. That work provided a solid basis for evaluating the effectiveness of the reformed social regulatory measures affecting tobacco smoking throughout Victoria.

Despite of highly commended research undertaken, it has not been considered as a decision support to any of the Australian State/ National Territory. As evidenced, none of the Australian States or National Territories relies on decision support programs in the process of tobacco smoking legislation (See Table 2).

**DISCUSSIONS**

The legal steps to collect and process information relevant to tobacco control legislation procedure all over Australia are alike. Although the State/National Territory Health Minister is entitled to decide whether to proceed with a recommendation for a new enforcement or change the existing enforcement, the Minister’s subjective judgement seems to be minimised thanks to the democratic
enforcement procedure applied. The procedure includes several filtering steps through which the recommendation goes in order to become the Bill.

Since there are two NGOs groups with opposite interests in tobacco control legal system (See Table 2), Health Group and Industry Group, their influence on tobacco social formulation varies across the country. The Health Group sometimes influences the change in legislation, but its submissions and opinions are never obligatory for the Minister to adopt. The Industry Group is very powerful in lobbying the Health Minister. The Industry Group can influence the parliamentarians directly by having capacity to spend money to influence the process of changing legislation in its own favour.

The organisations like Cancer Council and Heart Foundation primarily use media to influence the Minister to change the legislation. In some States/National Territories such as Australian Capital Territory, Hospitality and Tobacco Retailing Associations significantly influence the decision process in Parliament. In others, Queensland, New South Wales, Western Australia and Tasmania the stronger influence comes from The Health Groups.

The procedure also indicates that legally everybody is entitled to request a change of the existing tobacco control enforcement. The question is, however, to what extent can the interested groups influence the procedure to introduce a new enforcement? Perhaps an introduction of a decision support system that uses data and processes it through available computer programs in order to identify factors affecting the effectiveness of measures to prevent smoking might help to prevent the subjective judgements influence of each of the interested parties involved in tobacco smoking policy formulation.

Although the Federal Government is in charge of monitoring tobacco control legislation in Australia by editing The Tobacco and Other Smoking Product Act, the States/National Territories are entitled to slightly adjust the process. An interesting example is Tasmania which uses The QUIT Group to help monitor the process of selling cigarettes to minors.

When it comes to local governments to make by-laws, in all States this is applied, while still in Australian Capital Territory, Northern Territory and Tasmania it is not.

The issue of youth smoking is a complex one. There are opinions that too much attention should not be paid to youth smoking, but to look at changing the behaviour of adult smokers since youngsters idolise and adopt the behaviour of adults (Bachman et al, 1997).

According to our research project findings, the legislation related strictly to adolescents does not exist in any State/ National Territory. However, it does exist implicitly in two ways. One is the control of selling, promoting and advertising tobacco products. The other is educational school based programs.

The first way means to protect non smokers by encouraging social unacceptability of smoking, and to reduce the number of adults’ smokers to help reduce the number of young people who smoke. In this respect, some local governments introduce smoke-free areas in stadium, children playgrounds, and on the beach.

The second way, education programs, is applied in each State/National Territory. These programs cover alcohol, drugs and tobacco use. Since the school system in Australia is decentralised, the education that students receive about tobacco, alcohol and drugs varies considerably from school to school. Still schools have to address the State/National Territory Department of Education to have information about what resources might be available, but there is probably no consistency across the board concerning the information that is given to young people about tobacco. The tobacco related education programs are preventive by educating youngsters about harms the cigarette smoking causes to health.
There are some local governments throughout Australia, in particular in Tasmania that have introduced educational anti-smoking programs for juveniles.

Since municipalities are entitled to enforce rules that are not otherwise in the *State/ National Territory Tobacco Act*, it appears that, although limited to smoke-free environments and education among youngsters on negative health effects of smoking, they indirectly influence upon juveniles not to start smoking or, if youngsters are already addicted to nicotine, then to quit smoking. If decision makers have sufficient information which of the methods applied in the municipality mostly contributes to abandon or prevent smoking, then they could change the tobacco control enforcement to have direct influence on youngsters. For example, the effective way to supply such decision support information based on neuro fuzzy system approach was justified in six municipalities in Victoria (Petrovic-Lazarevic, Abraham and Coghill, 2004).

Neuro-fuzzy system is based on both fuzzy logic and neural networks. Fuzzy logic is a family of methodologies used in the analysis of incomplete, imprecise, or unreliable information. It enables approximate reasoning in which the rules of inference are approximate rather than exact (Bezdek, Dubois & Prade, 1999). Fuzzy *(if-then)* rules represent knowledge concerning the relationships between items. Membership functions are applied to determine the accuracy of each rule (Coghill & Petrovic-Lazarevic, 2002).

The fuzzy control model extends classical Boolean logic by implementing "soft linguistic variables on a continuous range of truth values which allows intermediate values to be defined between conventional binary" (Bezdek et al, 1999). It is extensively used in Artificial Intelligence programs. Neuro-fuzzy modelling is a type of Artificial Intelligence program that combines neural networks and fuzzy models (Petric, Abraham & Coghill; 2002) to apply linguistic variables. Neural networks combine “simple processing elements, high degree of interconnection, simple scalar messages, and adaptive interaction between elements” (Nguyen & Walker, 2000). Neuro-fuzzy modelling enables handling imprecision and uncertainty in data and refining them by a learning algorithm. It creates fuzzy rules in easy-to-comprehend linguistic terms (Petrovic-Lazarevic et al 2004). Fuzzy control model applied in estimating the type of social regulation comprises three variables relevant to every local government in each State/National Territory in Australia: the baseline condition (compliance rate by retailers’ obedience), maximum enforcement according to protocol, enforcement community education (no retailer education). Variables are presented in a membership form expressing explicit expert systems knowledge. *If... then* enforcement rules are introduced following the fuzzy control procedure. The applied model demonstrates an estimate of the outcomes of social regulation given its formal provision of the asocial regulation regime (Coghill & Petrovic-Lazarevic, 2002). The accuracy of the model was tested with the data from a project conducted in six local government areas of the western suburban of Melbourne in Australia in 1998 and 1999. In two local government areas there were programs of education directed both at the community and at retailers specifically and enforcement through prosecution with supporting media reporting of successful prosecutions. In one, there were no educational programs but there was enforcement through prosecution with supporting media reporting of successful prosecution. In the tree remaining areas- the control group- no change was made to seek higher levels of compliance. However, the proximity of the six local government areas and the common exposure areas might have been exposed to news of the successful prosecutions.

The model has limitations. Firstly, it only covers explicit knowledge based on social policies and procedures. Secondly, it does not reflect tacit, indirect, knowledge of community based on local ethics and norms that can significantly reduce adolescent smoking rates. Thirdly, the model does not provide government representatives with the answer to what extent to concentrate on available social regulation measures in anticipating enforcement efforts.

In order to improve the limitations, a neuro-fuzzy modelling based on combination of neural networks and fuzzy models has been applied. Neuro-fuzzy modelling is a way to create a fuzzy model "from data by some kind of learning method that is motivated by learning procedures used..."
in neural networks” (Bezdek et al, 1999). A Fuzzy Inference System can utilize human expertise by storing its essential components in rule base and database, and perform fuzzy reasoning to infer the overall output value. The derivation of if-then rules and corresponding membership functions depends heavily on the a priori knowledge about the system under consideration. However, since there is no systematic way to transform experiences of knowledge of human experts to the knowledge base of a fuzzy inference system, the Adaptive Network Based Fuzzy Inference System (ANFIS) and Evolving Fuzzy Neural Network (EFuNN) models applied the neuro-fuzzy support of knowledge management in social regulation was investigated (Petrovic-Lazarovic et al 2004). That is, the explicit knowledge based on social policies and procedures to reduce smoking among youngsters, but also the tacit knowledge expressed through the applied membership functions. Empirical results showed the dependability of the proposed techniques. Simulations were done with the data provided from the Australian State Victoria Government for the six local government areas of the State. Each data set was represented by three input variables and two output variables. The input variables considered were compliance rate by retailers, enforcement according to protocol and community education. The corresponding output variables were compliance rate by retailers and compliance rate by retailers projected as estimated rate of smoking uptake by minors. 70 per cent (random) of each data for training and 30 per cent (random) for testing were used. That is, the neuro-fuzzy models ANFIS and EFuNN were first trained on 70 per cent data. Then they were tested on 30 per cent data. ANFIS performed better than EfUuNN in terms of performance error with a comprise in time. EFuNN performed approximately 12 times faster that ANFIS. Hence where performance speed is the criteria to minimise time of a generated knowledge EFuNN sounds to be the ideal candidate. As EFuNN uses a one pass training approach it is also suitable for online learning of new data sets. Depending on governmental requests it is possible to compromise between performance error and computational time.

An important disadvantage of ANFIS and EFuNN are the determination of the network parameters like number and type of membership functions for each input variable, membership functions for each output variable and the optimal learning parameters.

With modelling comprising both tacit and explicit knowledge selection of optimal parameters may be formulated as an evolutionary search to make the neuro-fuzzy systems fully adaptable and optimal according to government representatives’ requests by providing the answer to what extent to concentrate on available social regulation measures in anticipating smoking enforcement efforts.

Evolutionary algorithms transform a set of objects, each with an associate fitness value, into a new population using operations based on Darwinian principle of reproduction and survival of the fittest, and naturally occurring genetic operations. The evolutionary algorithms learning technique can optimize the human knowledge from the database (Tran, Lakhami & Abraham; 2002). In particular, the evolutionary algorithms technique may be helpful in the cases where expert knowledge is explained by a natural language or written words. The usefulness of the evolutionary algorithms technique is in encoding the fuzzy rules of the method of automatic database learning in the fuzzy control and neural networks learning models and minimizing the number of rules by including only the most significant ones (Cordon& Herrera; 1997). The EvoPol (EVOlving POLicies) an evolutionary computation technique was used to optimize the if-then rules to support governmental policy analysis in restricting recruitment of smokers. The proposed EvoPol technique is simple and efficient when compared to the neuro-fuzzy approach. However, EvoPol attracts extra computational cost due to the population based hierarchical search process (Petrovic-Lazarevic, Abraham & Coghill; 2002b).

With the improvement of decision support systems, selection of optimal parameters may be formulated as an evolutionary search to make the neuro-fuzzy systems fully adaptable and optimal according to government representatives’ requests by providing the answer to what extent to concentrate on available social regulation measures in anticipating smoking enforcement efforts. Such information would by all means help to make tobacco control related decisions in order to improve tobacco smoking social policy formulation in Australia.
CONCLUSIONS

In order to analyse tobacco smoking policy processes in Australia, we have researched the existing tobacco control legislation procedure, role of NGOs in legislation, legislation monitoring, legislation relevant to adolescents, and the use of decision support systems in legislation procedure throughout all States and National Territories. Although the actual legislation procedure minimises the Health Ministers subjective judgements in the decision making process, it does not prevent the influence of NGOs to change the existing law or introduce a new law to satisfy their own interests. That points to vulnerability of the procedure itself.

Monitoring of legislation in each State/ National Territory covers advertising, promoting and selling tobacco products. Slight adjustment of entitled monitoring of legislation has brought an interesting experiment in Tasmania where QUIT group participates in controlling selling of cigarettes to minors.

The research findings clearly indicate non existence of legislation related strictly to juveniles in Australia. The enforcement in charge of selling, promoting and advertising tobacco products points to the justification of the approach of Bachman et al (1997) that a change of behaviour of adult smokers prevents youngsters to smoke or become smokers. On the other hand, school based programs about tobacco, alcohol and drugs, although educational to discourage the smoking of tobacco, do not specifically target adolescents. The exception is in Tasmania, where anti-smoking programs for juveniles are introduced in some municipalities.

With the results obtained in our previous work (Petrovic-Lazarevic, Abraham and Coghill, 2004) we suggest the use of decision support programs we applied for six municipalities in Victoria to both Federal Government and States and National Territories Governments to identify what mostly influences youngsters to remain non smokers or to quit smoking. Changing legislation based on adequate information will contribute to prevent juveniles becoming smokers and decrease a high death rate caused by smoking – related illnesses.

Further research is required to evaluate potential value of decision support softwares.
REFERENCES


<table>
<thead>
<tr>
<th>Question number</th>
<th>Interview questions</th>
<th>State or Territory</th>
<th>Australian Capital Territory</th>
<th>NEW SOUTH WALES</th>
<th>NORTHERN TERRITORY</th>
<th>QUEENSLAND</th>
<th>SOUTH AUSTRALIA</th>
<th>TASMANIA</th>
<th>VICTORIA</th>
<th>WESTERN AUSTRALIA</th>
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<tbody>
<tr>
<td>1</td>
<td>Does tobacco control legislation fall under federal jurisdiction or state/territory jurisdiction or both?</td>
<td>The Australian Federal Government is responsible for legal regulation of advertising and promoting tobacco products and selling cigarettes to minors. The States and the National Territories Governments are entitled to change laws relevant to smoke-free e</td>
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<tr>
<td>2</td>
<td>Enforcement of legislation state/territory level?</td>
<td>Federal Government regulates tobacco advertising and state/territory governments regulate restrictions on smoking</td>
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<tr>
<td>3</td>
<td>Are there any tobacco control measures at the local government level?</td>
<td>NA</td>
<td>Enforcement by local government</td>
<td>No local government enforcement</td>
<td>Environmental Health Organisations at local government enforce tobacco law</td>
<td>Enforcement by local government</td>
<td>No local government enforcement</td>
<td>Enforcement by local government</td>
<td>Environmental Health Organisations at local government enforce provisions of the Health Act only</td>
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<tr>
<td>4</td>
<td>Do local governments have the power to make by-laws?</td>
<td>NA</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
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<td>5</td>
<td>What differences are there between local state/territory and federal government powers?</td>
<td>Federal Government regulates tobacco advertising and state/territory governments regulate restrictions on smoking</td>
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<td>6</td>
<td>What other branches in the government are involved?</td>
<td>Department of Health or equivalent</td>
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<td>7</td>
<td>Details of the legislative process</td>
<td>Process is similar in each state/territory</td>
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<tr>
<td>8</td>
<td>Source of policy initiative</td>
<td>NGOs, The Council Cancer, Heart Foundation, AHFAE, Smoke-Free Coalition (Sydney based), Asthma Association, The Health Association, ACT Division of General Practice</td>
<td>Cancer Council of NSW, Action on Smoking on Health (ASH), National Heart Foundation, Australian Medical Association, Asthma Foundation, Labour Council</td>
<td>NGOs, National Level</td>
<td>Anti tobacco smoking groups</td>
<td>Tobacco companies, Hotels Associations</td>
<td>NGOs, QUIT Tasmania, Smoke Free Tasmania, (Health Foundation, Cancer Council and Unions), Tasmania Hotels Association</td>
<td>Health Groups, Cancer Council, QUIT</td>
<td>Health groups</td>
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<tr>
<td>9</td>
<td>Input of stakeholders</td>
<td>Representations from NGOs Members with the Tobacco Network Group (including Health Department staff and NGO staff)</td>
<td>No input reported</td>
<td>Discussion paper submission (two months for comments), website. Total 1300 submissions for the Review of 1998 Act.</td>
<td>Public consultations including newspapers in total 483 submissions.</td>
<td>Advertisement by internet etc.</td>
<td>No input reported</td>
<td>Public consultation with stakeholders including Tobacco and Hospitality Industries and NGOs (Health Foundation and Cancer Council)</td>
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<td>10</td>
<td>Role of public comment</td>
<td>As above</td>
<td></td>
<td></td>
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<tr>
<td>13</td>
<td>Department’s role</td>
<td>No formal review process exists.</td>
<td>Revision four yearly cycle</td>
<td>Driven by complaints</td>
<td>1998 Legislation was reviewed. To check was it last year or year before</td>
<td>Revision every fifth year.</td>
<td>Review approximately every 10th year</td>
<td>Not reported.</td>
<td>Revision four yearly cycle</td>
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<td>14</td>
<td>Review processes for legislation</td>
<td>As above</td>
<td></td>
<td></td>
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<tr>
<td>15</td>
<td>Indicators of policy success</td>
<td>No indicators reported</td>
<td>No indicators reported</td>
<td>No indicators reported</td>
<td>No indicators reported</td>
<td>No indicators reported</td>
<td>Prevalence of smoking and the whole range of indicators</td>
<td></td>
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<td>16</td>
<td>Interest groups’ influence on legislation</td>
<td>NGOs, The Council Cancer, Heart Foundation, AMAE, Smoke Free Coalition (Sydney based), Asthma Association, The Health Association, ACT Division of General Practice</td>
<td>Cancer Council of NSW, Action on Smoking on Health (ASH), National Heart Foundation, Australian Medical Association, Asthma Foundation, Labour Council</td>
<td>None of interest groups have significant influence.</td>
<td>Australian Hotel Association, Heart Foundation, ASH, Health promoting schools, Unions</td>
<td>None of interest groups have significant influence.</td>
<td>None of interest groups have significant influence.</td>
<td>Health groups</td>
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<tr>
<td>17</td>
<td>Role and stage of involvement of interest groups</td>
<td>NGOs are not actively involved</td>
<td>They are strong advocates for tobacco control</td>
<td>Interest groups put their input into the Department review paper.</td>
<td>NGOs make an influence through the submission process</td>
<td>Interests groups health related are less powerful to lobby minister than tobacco manufacturing companies.</td>
<td>QUIT Tasmania, Smoke Free Tasmania, Heart Foundation, Cancer Council and the Workers Union are active with submissions to the Department.</td>
<td>Interest groups are very powerful with their submission to the change of legislation.</td>
<td>Health groups</td>
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<td>18</td>
<td>Role of Cancer Councils, ASH etc.</td>
<td>Except Smoke Free Coalition, all other interests groups are very quiet</td>
<td>All interest groups have very good media advocacy skills</td>
<td>The Heart Foundation is most active in reviewing Tobacco Act</td>
<td>As above</td>
<td>These interests groups have money and public sympathy and they both systematically lobby the Minister and the Government</td>
<td>Only active in submissions</td>
<td>Health groups lobby a lot before elections.</td>
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<td>19</td>
<td>Input from academic research</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>QUIT, Cancer Council and academic institutions go for Department of Health tender</td>
<td>Not reported</td>
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<td>20</td>
<td>Collaboration with academic research</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Active</td>
<td>Not reported</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Recent initiatives</td>
<td>Revision of The Public Health Act 1991</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
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<tr>
<td>23</td>
<td>Use of decision support computing models</td>
<td>Unknown and unused</td>
<td>Unknown and unused</td>
<td>Unknown and unused</td>
<td>Unknown and unused</td>
<td>Unknown and unused</td>
<td>Unknown and unused</td>
<td>Unknown and unused</td>
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