

## **ABSTRACT FOR USE2009: Understanding Small Enterprises**

### **Abstract title:**

**Utilising the characteristics of small enterprises to assist in managing hazardous substances in the workplace.**

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The burden of disease and ill health due to exposures to hazardous substances in the workplace is extensive and excessive. Hazardous substance exposures, particularly in small enterprises, contribute substantially to this burden. It has been only relatively recently that attempts have been made to work with small enterprises in reducing these exposures.

The research literature on occupational health and safety (OHS) in small enterprises has extensive reference to barriers, challenges and problems associated with effectively implementing preventive OHS interventions. However, Larsson (2003) contends that there is no real proof that the size of an enterprise, in itself, is an important factor for OHS activities and Champoux and Brun (2003) report that most small business owners do not think that resources are a significant barrier to their improving health and safety.

There are certain characteristics of small business that potentially provide positive opportunities for the implementation of preventive interventions. Few interventions however, have been developed utilising these positive characteristics.

Building on the results of a recently completed survey of managing hazardous substance exposures in small businesses in New Zealand, this paper identifies these characteristics and outlines the opportunities to utilise them in working with small businesses to prevent and reduce exposures to hazardous substances.

An intervention framework has been developed that is modelled on recent successful intervention strategies and utilises the positive characteristics of small enterprises in intervention implementation. It focuses on key components of the small business including working with the owner/ manager and intermediaries, the work environment, organisational factors and worker/ human factors. The framework

extends the model developed by Hasle and Limborg (2006) and incorporates the Small Business Exposure Index (SBEI) developed by LaMontagne et al (2009) for intervention needs assessment and the evaluation of intervention effectiveness.

**Key words:**

Small enterprises, chemical exposures, intervention effectiveness.

## **Utilising the characteristics of small enterprises to assist in managing hazardous substances in the workplace.**

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### **Introduction**

In New Zealand, as elsewhere in the world, the burden of disease and ill health due to chemical exposures in the workplace is extensive and excessive. Hazardous substance exposures, particularly in small enterprises, contribute substantially to this burden. It has been only relatively recently, that attempts have been made to work with small enterprises in reducing these exposures.

There is a growing field of research on the occupational health and safety issues concerning small enterprises (SE's) internationally. However, the literature is fragmented and the focus of the research is diverse and disparate. Only until very recently, has the research been examined to identify effective approaches to SE's and to suggest future research strategies (Mayhew, 2002; Champoux and Brun, 2003; Lamm and Walters, 2003; Hasle and Limborg, 2006). Even with this examination, conceptual frameworks for OHS and small business, particularly in relation to managing hazardous substances, are theoretically vague and empirically not well supported.

The range of hazards and exposures encountered in small business are reported to be extensive and excessive, although Lenz et al (2001), suggests that many hazards are similar across businesses and industries, regardless of size; yet others may be unique to small businesses and industries that are predominated by small employers.

Bearing these complex issues in mind, what then are the features of small business that make research and in particular provision of support and services to small enterprises problematic? Many studies have identified the characteristics of small business that highlight difficulties and challenges for owners/managers, enforcement agencies and researchers (Eakin et al, 2000; Okun et al, 2001; Lenz et al, 2001; Oldershaw, 2002; Champoux and Brun, 2003; Barbeau et al, 2004; Walters, 2006). However, few if any studies, have identified the positive features of the characteristics of small business and the opportunities these have for the promotion of occupational health and safety practice and research (Larsson, 2003).

This paper examines the characteristics of small business and identifies not only the challenges and difficulties faced by small business owners/ managers and employees, but also some of the unique features of SE's that provide positive opportunities for OHS intervention design, development and evaluation. The implications of these features for intervention research and in particular studies on the effectiveness of interventions to reduce hazardous chemical exposures in SE's are discussed.

### **Characteristics of small business**

Small enterprises are not homogeneous but there are a variety of characteristics that seem to be common to such entities. The literature supports the argument that the management structure in a business with over 20 employees becomes more formalised and the management of occupational safety and health, including chemical risk management, improves (Lamm, 2000; Lamm & Limborg, 2000; Gardner, 2000; Oldershaw, 2002; Lamm & Walters, 2003; Walters, 2006; Legg et al, 2008). In addition, the concept of owner-management and the ability of small business owners to directly influence business decisions are acknowledged as the fundamental distinguishing characteristics of small business.

The management of OSH in small enterprises has been extensively reviewed (Mayhew, 1997a, 2002; Lamm, 2000; Lamm & Limborg, 2000; Gardner, 2000; Lentz, Sieber, Jones, Piacitelli, Catlett, 2001;; Okun, Lentz, Sieber, Jones, Piacitelli, Catlett, Schulte, & Stayner, 2001; Oldershaw, 2002; Champoux & Brun, 2003; Lamm & Walters, 2003; Larsson, 2003; Barbeau, 2004; Eakin, Hasle & Limborg, 2006; Walters, 2006; Legg et al, 2008). The consensus of opinion in these studies is that management in small businesses is more informal; the lines of communication are short, the communication is more often oral than written, the structure is simple and commercial pressures are very high and immediately felt. Moreover, it is impossible to separate OSH practices from other aspects of small business management such as financial management, selection and recruitment of staff, task training. Overall, small businesses' health and safety management, particularly in relation to hazardous substances, is poor.

The owner-manager is the key person in the small enterprise and it is their values that determine the businesses approach to health and safety management (Vickers, 2003; Hasle & Limborg, 2006; Antonsson, 2007). Many owners consider health and safety to be the employees' responsibility (Vickers, Baldock, Smallbone, James & Ekanem, 2003; Hasle & Limborg, 2006) and often are not aware of legislative requirements (Vickers et al, 2003; Caple, 2006; Hasle & Limborg, 2006; Antonsson, 2007).

In general, small businesses owners often take a reactive and ad hoc approach to health and safety, as problems are usually only resolved when they become apparent. Hasle and Limborg (2006) suggest that this is due to a combination of factors. Firstly, the owner-manager often believes that responsibility for health and safety lies with employees and secondly, that accidents are a rare experience within the individual small business. Interviews with small business owners showed that most of them had a good awareness of the most immediate risks associated with their business (Vickers et al., 2003). Even in those small businesses which demonstrate a high level of health and safety awareness, assessment of risks is likely to be implicit, informal and sometimes reactive (Legg et al, 2009) as opposed to more systematic and explicit approach that is promoted by the Health and Safety Executive (Vickers et al., 2003).

## **Barriers and challenges**

In the literature concerning occupational safety and health and small businesses, the most recurring theme is the identification of problems and challenges faced by employers, employees, enforcement agencies and researchers in relation to controls and interventions.

Eakin et al. (2000) report several key challenges in relation to OHS and small business: a highly competitive and constantly changing economic environment, the nature of their organizational entities in which multiple functions are carried out by the same person, owners' limited view of what they can accomplish regarding health and safety given lack of money and expert staff, informal management structures and employment practices, and lower unionization rates, which decrease opportunities for workers to advocate for OSH.

Other characterizations of small businesses include; communications are oral and not written; there is a dependency on suppliers for information; literacy among workers is generally poor; a belief exists that the chemicals being worked with are not dangerous; there is poor knowledge of health effects; there is better perception of acute rather than long term health effects; controls are decided by custom and practice and not by risk assessment (Oldershaw, 2002).

Data on owners' behaviours toward health and safety in small businesses are limited and conflicting. In interviews, owners describe numerous barriers including limited resources, lack of in-house expertise, and production pressures (Eakin et al, 2000; Barbeau et al, 2004; Legg et al, 2009).

In summary, these barriers and challenges can be categorized into a range of factors as shown in Table 1.

**Table 1 Summary of barriers to OHS initiatives in small business.**

<b>Factor</b>	<b>Authors</b>
<b>Economics</b>	
Highly competitive environment	Eakin et al 2000, Mayhew, 2002
Changing economic environment	Eakin et al 2000
Labour market restructuring	Quinlan 1998, Mayhew and Quinlan 1997

	<p>Lack of funds Lack of resources Production pressures Burden of compliance</p>	<p>Eakin et al 2000 Okun et al 2001, Mayhew 2002, Lamm 2002 Barbeau et al 2004, Mayhew et al 1996, Lawlor 1988 Bell 1996, Lamm 2002</p>
<b>Staff</b>	<p>Multiple functions Lack of expert staff Poor knowledge of health effects Lack of understanding of regulations “Management skills gap”, reliant on advisors</p>	<p>Eakin et al 2000 Eakin et al 2000, Okun et al 2001 Oldershaw 2002 Lamm 1999 Lamm 2003</p>
<b>Perceptions</b>	<p>Limited view of what they can accomplish Believe chemicals not hazardous Understand acute more than chronic effects</p>	<p>Eakin et al 2000 Oldershaw 2002 Oldershaw 2002</p>
<b>Management Structure</b>	<p>Informal structure Employment practices</p>	<p>Eakin et al 2000, Lamm 2002 Eakin et al 2000, Lamm 2002</p>
<b>Employment relations</b>	<p>Low rates of unionization Decrease in OHS advocacy Low rates of worker participation</p>	<p>Eakin et al 2000 Eakin et al 2000 Lamm 2003</p>
<b>OHS management systems</b>	<p>Lack of hazard management systems Lack of reporting &amp; surveillance systems Controls based on custom and practice not risk assessment</p>	<p>Okun et al 2001, Mayhew 2002, Lamm 2002 Okun et al 2001, Mayhew 2002 Oldershaw 2002</p>
<b>Communications</b>	<p>Oral, not written Informal Dependency on suppliers for information Literacy generally poor</p>	<p>Oldershaw 2002, Mayhew 2002 Oldershaw 2002, Mayhew 2002 Oldershaw 2002 Oldershaw 2002</p>
<b>Enforcement</b>	<p>Do not trust enforcement agencies Feel alienated from the state Believe they have not been consulted by state Agencies have insufficient resources</p>	<p>Mayhew 1997, Lamm 1997, Lamm 2002 Mayhew and Quinlan 1998 Woolfson 1995, Lamm 2002 Quinlan and Mayhew 2000</p>
<b>Standards</b>	<p>Federal standards not applied Exemptions from record keeping</p>	<p>Lenz et al 2001, Mayhew 2002 Lenz et al 2001</p>
<b>Insurance/ Compensation</b>		

Self-employed, contractors, subcontractors often excluded	Mayhew 1997, Lamm 2002
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In addition, Brosseau and Li (2005) suggest that small business owners' intentions toward improving workplace health and safety are primarily influenced by their attitudes. Owners' outcome, normative and control beliefs all contribute to their attitudes toward workplace health and safety. Subjective norm and perceived behavioural control by workers do not have any significant impact on small business owners' behavioural intentions toward workplace health. Interventions aimed at these underlying beliefs, particularly those shown to be most highly associated with high intentioned owners, may be successful in bringing about improvements in attitudes, intentions and behaviour. Raising owners' expectations about positive employee health and business productivity outcomes may lead to long-term improvements in their attitudes, intentions and behaviour toward workplace health and safety.

**Positive features and opportunities**

Larsson (2003) contends that there is no real proof that the size of an enterprise in itself is an important factor for OHS activities. He suggests that the core assumption of high risks, poor hazard management and high incidence of occupational trauma and disease in small business as opposed to lower risks, better hazard management and thus low trauma and disease in large enterprises, seems hard to prove convincingly.

Champoux and Brun (2003) found that most small business owners do not think that resources are a significant barrier to their improving health and safety. In a study of 223 owners of small business (fewer than 50 employees) only 37% of respondents thought cost were an important barrier to health and safety improvements.

Lepoutre and Heene (2006) described factors specific to small business that relate to the adoption of socially responsible behaviour (including the health, safety and wellbeing of employees) by the owner/ manager. These were classified into issue, personal, organizational and context characteristics. Issue characteristics refer to the situation or the matter of concern to small business socially responsible behaviour; personal characteristics relate to the values, competencies and actions of the owner-

manager; organizational characteristics involve the tangible and intangible resources and structures of the firm; and context characteristics refer to the economic, social and institutional factors, which are external to the organization.

In addition to these factors, there are certain characteristics of small business that potentially provide positive opportunities for the implementation of preventive interventions (Laird and Perry, 2007). The combination of these factors and characteristics are presented in Table 2, and provides a framework from which to influence and support the small enterprise owner/ manager introduce and implement OHS interventions.

**Table 2. Factors and positive characteristics of small enterprises relating to OHS interventions**

<p>Issue Characteristics</p> <ul style="list-style-type: none"> <li>• OHS</li> <li>• Employment/ Employee relations</li> <li>• Environmental Management</li> <li>• Social Responsibility</li> </ul>	<p>“Good employer” – cares about the health, safety and well-being of employees  “Green” values – respectful of natural resources and the environment  “Good citizen” in local community</p>
<p>Personal Characteristics</p> <ul style="list-style-type: none"> <li>• Attitude</li> <li>• Sense of personal responsibility</li> <li>• Internal locus of control</li> <li>• Cognitive and personality factors</li> <li>• Intention to act</li> <li>• Knowledge/commitment</li> <li>• Sensitive to activities related to immediate internal stakeholders</li> <li>• Loyalty in the relationships with customers/ employees</li> <li>• Openness, honesty and fairness in business activities</li> </ul>	<p>Generally positive attitudes toward OHS  Paternal relationship with employees  Direct and immediate  Good business person/ motivated/achieve  Influenced by attitudes/ outcomes  Implicit/ aware of risks generally/ intend to act  Evidence that owner cares for employees  Perceived favourably by employees and the local community in terms of loyalty, honesty and fairness in business activities.</p>
<p>Organisational Characteristics</p> <ul style="list-style-type: none"> <li>• Resources/ financial</li> <li>• Work environment changes</li> <li>• Equipment</li> <li>• Systems</li> <li>• Networking</li> <li>• Organisational learning</li> </ul>	<p>Evidence of financial/ resource issue conflicting  Relatively easy to determine nature and extent of change to work environment  Equipment important to SB owners  Systems (IT) are in place in the SB and can be utilised  Networking improves knowledge,</p>

	attitudes and uptake of innovations Positive outcomes from organisational learning in SB.
Context Characteristics <ul style="list-style-type: none"> <li>• External stakeholders (ES)</li> <li>• Socio-economic context</li> <li>• Small business environment</li> </ul>	Good reputation, market perception, quality, value for money important to ES Economic profile/ legislative framework of country important; level playing field Support and incentives for compliance; positive industry culture; effective industry associations provide leadership and guidance

Laird and Perry (2007), adapted from Lepoutre and Heene (2006)

The main forces or influences that impact on the small businesses and how they are managed relate to competition, regulatory pressure and the supply chain, from the suppliers through to the contractors and the customers.

The most successful intervention methods appear to be action-oriented, low cost approaches, combining health and safety with other management goals, and based on trust and dialogue. It is suggested that intervention research should look at the whole intervention process from the external actors/influencers (for example, government agencies and intermediaries) through to the dissemination process, the uptake of the small business and the effect on health and safety. Intervention models are described in the next section and guide the development of intervention research in small businesses. The models address several factors that are important to consider and analyse when developing interventions and influencing small business occupational safety and health, including chemical hazard management.

### **Conceptual models for managing hazardous substances in SE's**

A number of conceptual models have been developed that may help to enhance our understanding of health and safety interventions in small businesses and their effectiveness. These models include those developed by Lamm (1997), Antonsson, Birgersdotter and Bornberger-Dankvardt (2002); Vickers, Baldock, Smallbone, James and Ekanem (2003), LaMontagne et al (2005); the Health and Safety Executive (2006); Antonsson, Birgersdotter and Christensson (2006) Hasle and Limborg (2006); and Pratt (2007).

Hasle and Limborg, 2006 developed a useful model of intervention research in small businesses. They suggest that researchers focusing on the development of interventions for small business need to study the complete system, starting with the intermediary agency reaching out towards the smaller enterprises, then continue with methods to get in contact, and finally to study the effect in the small enterprises, which include both the process of getting the intervention accepted, the intervention itself, and the outcome.

Vickers et al. (2003) developed a model where they illustrate what they consider to be the main external influencers independently of each other and list different internal characteristics that influence the health and safety outcome in the small business. They emphasise that the market the small businesses operate on has the greatest impact on occupational health and safety and OSH management in the small businesses.

In a later Swedish study, Antonsson et al. (2006) analysed why businesses, including small businesses, do not implement known measures to reduce chemical exposure. This study developed a 'measure staircase' (translation of the Swedish word "Åtgärdsstrappen") that describes the knowledge that is needed and the decisions the business needs to take to be able to implement solutions to OSH problems that are effective.

The 'measure staircase' model indicates that a problem can only be solved satisfactorily if the owner-manager and employees are aware of the problem (first step), accept it (second step), know the cause of the problem (third step), have knowledge of a solution (fourth step), accept the solution (fifth step), have knowledge of a supplier (sixth step) and can afford the solution (seventh step). The solution can therefore be implemented if they have the ability to do so and utilise it in a practical sense (eighth step) and finally evaluate the effect (the final step).

Pratt (2006) uses a risk control chain model, which is specific to the control of hazardous chemicals. Pratt's model has five steps. When the business deals with a hazardous substance it has to firstly, recognise that the hazard exists; secondly,

understand the (degree of) risk; thirdly, identify appropriate controls; fourthly, implement and monitor controls and which should fifthly, eliminate or minimise the risk.

Pratt (2006) identifies different factors in the small business environment which have an impact on the different steps in the control chain. He distinguishes between the factors in the small business environment that the business has control over and factors external to the small business, which are beyond the immediate control.

The models identified above address several factors that are important to consider and analyse when developing interventions and influencing small business occupational safety and health, including chemical hazard management. Vickers et al. (2003) along with others have found that the nature of the business defined by the industry it belongs to and the market it operates within is the main influencer on the OSH outcomes (Antonsson, 2007; Biggs, 2000; Gervais, 2006; Hasle & Limborg, 2006; Larsson, 2003; Pratt, 2006; Vickers et al., 2003; Walters, 2006). Many authors therefore recommend the development of industry specific interventions with a focus on the small businesses specific external intermediaries, internal culture, its needs and internal resources and processes.

The suppliers, producers and importers of hazardous chemicals could play a key role in reducing exposures to hazardous chemicals. They have the legal obligation to provide information on hazardous chemicals and control strategies. Unfortunately, material safety data sheets are criticised for being too complicated and lengthy and are therefore not user-friendly for small businesses.

Table 3 summarises the different characteristics of small businesses OSH management (including management of hazardous chemicals) and the owners approach to OSH management.

**Table 3. Small business approaches to OSH management**

<b>The characteristic of small business management, the approach to OSH and chemical management</b>	<b>Source</b>
Chemical risk management is perceived as difficult.	Antonsson, 2007
Chemical risk management takes too much time.	Antonsson, 2007
Few resources so the manager must be a multi “expert”.	Antonsson, 2007; Walters, 2006; Biggs, 2000
Often no safety representative.	Antonsson, 2007; Walters, 2006
Few small businesses have a hazard management system. E.g. 50% in a Swedish study.	Antonsson et al., 2002
The quality of risk management is poor in small business.	Walters, 2006
Need for solutions as opposed to advice that highlights problems.	Antonsson, 2007; Antonsson et al., 2006; Pratt, 2006
Oral communication.	Biggs, 2000; Dryson, 1993
Low level reading ability.	Biggs, 2000
Reactive management style E.g. accidents improve safety.	Biggs, 2000; Hasle & Limborg, 2006
Owner-manager plays a key role in the small business.	Biggs, 2000; Hasle & Limborg, 2006; Walters, 2006
Responsibility for managing hazardous substances is not defined.	Biggs, 2000
Owners think that some one will tell them if they do not manage OSH or chemicals as the law requires.	Fairman & Yapp, 2005

Furthermore, several studies report that small businesses have a tendency to assess their OSH, chemical risk management and performance more positively than researchers when they assess their knowledge through content questions or site visits (Simonsen et al., 2003; Vickers et al., 2003; Fairman & Yapp, 2005; Pratt, 2006). A recent survey of small businesses OSH practices in New Zealand (Laird et al, 2008; Olsen et al , 2009), found that the owner-managers assessment of their knowledge of OSH legislation was very different from the researchers’ assessment of their answers to content questions. Some managers with better knowledge rated their knowledge poorly whilst those who rated their OSH legislative knowledge more highly tended to be the least aware (Laird et al, 2008; Olsen et al , 2009).

## **Models of intervention**

A number of studies have looked at interventions to improve health and safety outcomes in small businesses as well as their effectiveness. The studies include work by Walker & Tait (2004); Caple (2006); Lazovich, Murray, Brosseau, Parker, Milton and Dugan (2002); Antonsson and Alvarez (2005), Fairman and Yapp (2005) and LaMontagne et al (2003, 2004, 2005 and 2009).

The practice of occupational hygiene entails the anticipation, recognition, evaluation, and control of exposures to health hazards in the workplace (Mulhausen & Damiano, 1998). The further “upstream” away from exposure one aims for practicing occupational hygiene, the more likely one is to achieve the preferred goal of exposure prevention versus control.

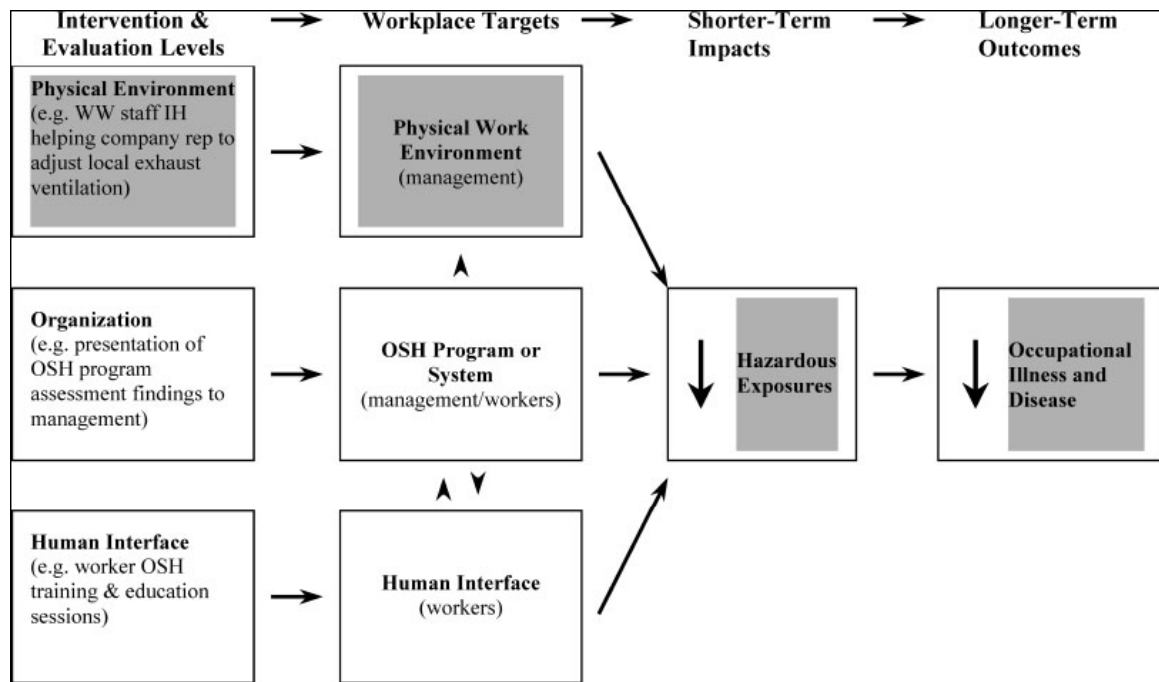
Hazard prevention aims to avoid the creation of hazards, whereas hazard control aims to reduce or mitigate hazards once they have been created (Bennett, 1999). LaMontagne et al (2003, 2004 and 2005) devised a rating scheme in line with these principles. They applied a simplified “hierarchy of controls” to express a gradient of upstream (*materials* correspond with *source* of the hazard) versus midstream (*process* corresponds with *path* between source and worker) versus downstream (*human interface* corresponds with the level of the worker as the *receiver* of exposure) preventive efforts.

LaMontagne et al (2003) developed an exposure prevention (EP) rating scheme to evaluate the effectiveness of the Wellworks 2 intervention with respect to the prevention and control of hazardous substance exposures in manufacturing businesses in the US. Wellworks-2 was a 16 month randomized, controlled trial examining the effectiveness of an integrated health promotion and occupational health protection intervention (Sorensen et al, 2002), with the worksite as the unit of assignment and intervention. The central hypothesis was that blue-collar workers would be more likely to make changes in health risk factors that are primarily under their control (smoking and nutrition) if risk factors that were primarily under the company’s control (occupational exposures to hazardous substances) were being addressed at the same time.

The EP rating scheme was designed (1) to systematically prioritize needs for intervention on hazardous substance exposures in manufacturing work sites, and (2) to evaluate intervention effectiveness. The rating scheme assesses the degree of upstream prevention efforts observable in a given process or similar exposure group. This provides a complement to—but not a replacement for—quantitative exposure assessment. The goal was to develop a method that could be applied with modest expense by OHS researchers and other groups engaged in workplace prevention and control efforts (e.g., independent OHS professionals, company or union OHS staff). The rating scheme was complemented by parallel evaluation with individual-level questionnaires and organizational-level assessment of OHS programs (LaMontagne et al, 2004).

A baseline assessment was used to tailor intervention activities to the needs of each study site. Corresponding to the needs assessment and evaluation strategy, the interventions targeted three levels: (1) the physical work environment (through specific recommendations for changes in materials, processes, and other exposure prevention and control measures), (2) the organization (through management-level intervention on general OHS management principles), and (3) the individual worker (through worker educational activities) (Sorensen et al, 2002). The Wellworks-2 OSH intervention was designed around a three level social ecological framework, with specific intervention activities at the level of the worker (for example, OSH training and education), the organisation (for example, management consultation on OSH), and the physical work environment (for example, tailored efforts to improve the prevention and control of hazardous substance exposures). Each level contributes to reduction in hazardous exposures and associated adverse health outcomes (Fig. 3).

**Figure 3. Wellworks 2 Intervention model.**



Source; LaMontagne et al (2005)

LaMontagne et al (2005) combined these with an examination of the balance between exposure potential and exposure protection at each of these three levels. The resulting Potential and Protection matrix, expressed as a 2 x 3 table, allows both a horizontal (balance of Potential and Protection at each level) and a vertical (degree to which those efforts are focused upstream) assessment of exposure prevention. The EP rating method used has several strengths. First, it captures the degree of upstream prevention applied to hazardous substance exposures in general. This overcomes the feasibility challenges of evaluating intervention effectiveness for a variety of hazardous substances, particularly when the variety of substances differs across production processes, worksites, and intervention conditions. Further strengths include the linking of needs assessment, intervention recommendations, and effectiveness evaluation for each process assessed.

The Wellworks-2 intervention emphasized intervention at the source, and showed corresponding patterns of change in the intervention group as described above. In addition, the shift away from exposure limit-based regulation towards solutions based strategies provides an opportunity to refocus upstream.

LaMontagne et al (2009) has developed a refinement of the exposure prevention (EP) rating method developed for the Wellworks-2 trial and has been adapted for use in a subsequent intervention trial in small to medium-sized manufacturing businesses: the Healthy Directions-Small Business project (LaMontagne et al, 2008)). This EP rating scheme (Small Business Exposure Index, SBEI) was complemented by parallel evaluation with individual-level questionnaires and organizational-level assessment of OHS programs, or management systems, in both Wellworks-2 and Healthy Directions-Small Business.

The basis of the SBEI scoring method on the hierarchy of controls supports its face validity. Furthermore, when used as pre- and post- intervention effectiveness measures, the baseline assessment of each area serves as its own reference or control, with the final evaluation metric being a measure of change. To the extent that a given area or process does not change fundamentally over the course of the intervention (e.g., gets replaced with an unrelated process or gets phased out), this strategy overcomes limitations inherent in comparing area ratings and scores cross-sectionally as well as longitudinally (as an intervention effectiveness measure).

The SBEI exposure prevention rating method is suitable for use in small enterprises, has good discriminatory power and reliability, offers an inexpensive method for intervention needs assessment and effectiveness evaluation, and complements quantitative exposure assessment with an upstream prevention focus.

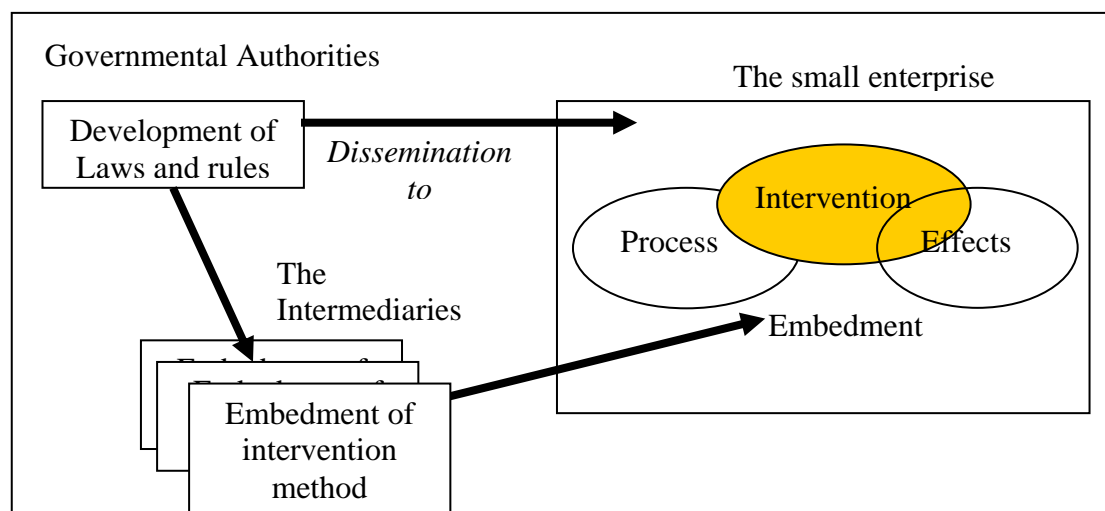
A recent critical literature review of industrial hygiene intervention recommendations found a greater emphasis in practice on exposure control in the path between source and worker or at the worker level, rather than on the source [Roelofs et al., 2003].

### **Development of Interventions to Reduce Hazardous Chemical Exposures in Small Businesses in New Zealand**

As part of a study of preventive interventions to reduce hazardous chemical exposures in small business in New Zealand (Laird et al, 2008), a modified Hasle and Limborg (2006) model for intervention research in small business was developed to identify the intermediaries and the relevant governmental laws and standards applicable to each small business industry sector involved in the study i.e. hairdressing, apple growers, printing and wood furniture manufacture (Fig.2.). Laird et al (2008) and Olsen et al

(2009), report on the results of a baseline survey within these industry sectors, where this modified model was utilised.

Figure. 2. The identification of the industry specific intervention in the small business.



Adapted from Hasle and Limborg (2006)

### Objectives of the proposed intervention

In addition, an intervention strategy and study proposal to evaluate this was developed as an outcome of this study (Laird et al, 2008). It is proposed that the intervention protocol for this study utilises the Wellworks 2 intervention model devised for the manufacturing industry (LaMontagne et al, 2005), the baseline survey tool developed by Laird et al (2008) and the SBEI (LaMontagne et al, 2009) and the factors and positive characteristics framework developed by Laird and Perry (2007) to influence, engage and support the small business owner/ manager.

The interventions would be targeted at the three levels within the business; work environment, organisational systems and procedures, human interface. The interventions would consist of a:

- Technical/ advisory component focussing on improvements to the work environment
- Safety systems component, developing or introducing safety systems with in the organisation to assist in the management of hazardous substances.
- Education and training component, focussing on OHS and chemical safety management.

The objectives of the intervention would be specific to the industry sector identified and the following evaluative hypotheses would be tested:

H<sub>1</sub> – The intervention would significantly improve scores/ responses from the pre to post intervention questionnaire and the SBEI ratings

H<sub>0</sub> - No significant improvement in scores/ responses from the pre to the post intervention questionnaire and the SBEI ratings

In addition, the development and implementation of the intervention would utilise key positive characteristics of small enterprises identified earlier to influence, engage and support the small business owner/ manager and include:

- Owner/ manager attitudes
  - Concept of the “good employer”
  - Generally positive attitudes toward OHS
  - Paternal relationship with employees
  - Intention to act (attitudes and outcomes)
  - Promote OHS networking
  
- Work environment
  - Internal locus of control
  - Changes to the work environment (chemical storage, ventilation)
  - Low cost solutions
  
- Organisational factors
  - Introduction of a hazard management system
  - Chemical inventory
  
- Human interface
  - Organisational learning (implicit and explicit – Employee training and education)
  - Supervision - Personal protective equipment use

*Study design and population:* The proposed study replicates the Healthy Directions-Small Business methodology where the *Intervention* is a randomized controlled trial

that assesses the effectiveness of an integrated hazardous chemicals management program. The worksite will be the unit of randomization and intervention with 20 worksites recruited and pair-matched on unionization status (i.e. whether or not they were unionized). One worksite in each pair will be randomly assigned to the intervention; the other to the minimal-intervention control strategy. Pre and post intervention knowledge, attitudes, perceptions and behaviours would be assessed by the completion of a questionnaire.

In addition, changes to the summary scores of the SBEI (pre and post intervention) will be determined. The scoring of the SBEI is as follows. The first page of the SBEI checklist records general information about each process, such as numbers of workers, general air quality, housekeeping, obvious safety issues, odours, evidence of spills of potentially hazardous substances, and visible evidence of hazardous contaminants. Brief impressions of physical, safety, and ergonomic stressors are also recorded, though not incorporated into the hazardous substance exposure prevention rating process.

This is followed by more specific assessments of materials used, the process, and the human interface. Variable numbers of processes would be assessed at each site, yielding a comprehensive and systematic assessment of potential for, and protection from, hazardous substance exposures for each worksite.

The overall proposed intervention strategy, able to be developed for the specific industry sector identified, is illustrated in Appendix 1. This shows the relationship between:

- the baseline pre-intervention survey,
- the interaction and engagement of the intermediaries (industry associations, suppliers, external agencies),
- the pre-intervention SBEI evaluation,
- the implementation of the intervention at the three levels within the business (work environment, organisational systems and human interface)
- a formative/ process evaluation of the intervention
- post intervention survey

- post intervention SBEI evaluation

The intervention would involve collaboration between intermediaries, enforcement and prevention agencies and research team specialists in occupational hygiene and health promotion.

The following intervention outcome measures would be assessed.

1. Observable/ documented improvement in chemical storage, handling and use of controls.
2. OHS management systems introduced and used effectively
3. Chemical inventory developed and maintained.
4. Significant improvement in scores/ responses of knowledge and understanding of key items in the baseline survey and the SBEI ratings
5. Prevalence of protective equipment use

### **Implications for Intervention Research**

Intervention research is the testing and evaluation of interventions, programs, and policies. To date, a variety of approaches to intervention have been developed to protect worker safety and health across a broad spectrum of industries. Although there have been measurable improvements in worker safety and health, only a few interventions, alone or in combination, have been systematically evaluated. Consequently, many interventions are undertaken based on faith and expert judgment without convincing evidence that these approaches are effective. However, there are excellent examples of interventions that have been evaluated and shown to be effective.

It has been said that one of the greatest problems in occupational safety and health is the lack of research involving the dissemination, adaptation and utilization of appropriate OHS information. In addition, the need to focus OHS expertise on small businesses is now established in many countries, but effective mechanisms to reach, assist and impact these companies continues to be an area of uncertainty (Okun et al 2001). To date, most OHS research and interventions have been primarily based on lessons learned from large companies. OHS researchers, preventive and enforcement agencies need a detailed understanding of the small business environment and the

motivations, drivers and challenges faced by small business owners/managers in the design, development and implementation of preventive interventions.

Specific problems, limitations and needs of small businesses have not been thoroughly examined, and in particular how to engage, influence and support small enterprise owners/ managers manage hazardous chemical exposures.

The potential to utilise the characteristics of small business to implement preventive interventions has not been thoroughly examined. A catalogue of barriers and challenges to OHS promotion in small businesses have been identified and whilst important to acknowledge these, there appears an opportunity to utilise the positive characteristics of small business in designing, developing, implementing and evaluating future OHS interventions.

### **Summary and Conclusions**

The research literature on OHS in small enterprises has extensive reference to barriers, challenges and problems associated with effectively implementing preventive OHS interventions. The owner-manager is the key person in the small enterprise and it is their values that determine the businesses approach to health and safety management. There are certain characteristics of small business that potentially provide positive opportunities for the implementation of preventive interventions. Few interventions however, have been developed utilising these positive characteristics.

Building on the results of a recently completed survey of managing hazardous substance exposures in small businesses in New Zealand, this paper identifies these characteristics and outlines the opportunities to utilise these in working with small businesses to prevent and reduce exposures to hazardous substances.

An intervention framework has been developed that is modelled on recent successful intervention strategies and utilises the positive characteristics of small enterprises in intervention implementation. It focuses on key components of the small business including the working with the owner/ manager and intermediaries, the work environment, organisational factors and worker/ human factors. The framework

extends the model developed by Hasle and Limborg (2006) and incorporates the Small Business Exposure Index (SBEI) developed by LaMontagne et al (2009) for intervention needs assessment and the evaluation of intervention effectiveness.

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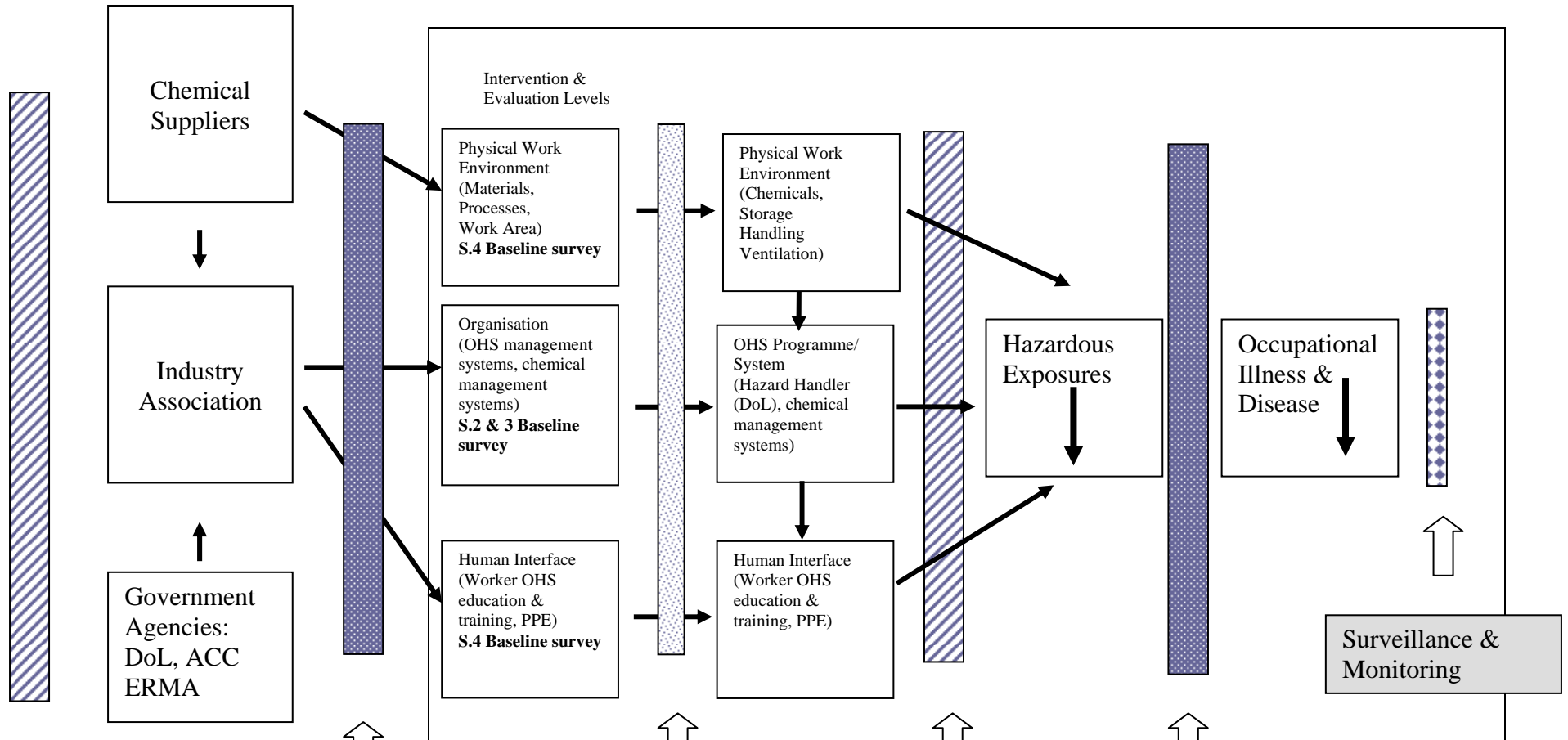
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**Appendix 1 Intervention protocol and evaluation strategy to be used for selected industry sectors and controls.**



**Pre-Intervention Assessment (Baseline Survey – Knowledge, Attitudes, Perceptions, Practices s.2, 3, 4)**

- Hairdressing
- Printing
- Apple growing
- Wood furniture manufacture

**Pre-Intervention Exposure Prevention Assessment (SREI #1)**

**Formative/Process Evaluation (Optional)**

**Post-Intervention Assessment (Knowledge, Attitudes, Perceptions, Practices)**

**Post-Intervention Exposure Prevention Assessment (SREI #2)**