

## 6. RESULTS

### 6.1 Demographics of Participants

The sample was relatively well educated. Less than 2.5% reported no formal schooling (*questions 2.4.1 and 2.4.2*) and over 40% had some form of post-school training (*question 2.4.3*), either a diploma (26% of the total sample; 31% of industry; 24% in transport 24% in agriculture and 18% in consumers) or a degree/technicon qualification (18% of the total sample; 21% in industry; 13% in transport, 13% in agriculture and 21% amongst consumers). The least educated respondents were those in agriculture, where 31% had less than a primary school education (Pearson  $\chi^2 = 42.8$ ;  $p < 0.001$ ) and 7% (comprising 5 of 10 individuals in the entire sample) had no schooling at all. Educational level was also related to the type of employee, as would be expected. For example, laboratory personnel (89%) and managers/supervisors (58%) were more likely than safety stewards (48%) or production workers (40%) to report post-matric qualifications ( $p < 0.001$ ).

The sample was predominantly male, reflecting the demographics in different industries and age distribution consistent with a predominantly working population. Agricultural workers had the highest proportion of older workers (52% of agricultural workers were 40 years or older) and industrial workers the highest proportion of younger working adults (22% younger than 30 years). Consumers had the highest proportions of respondents at either extreme of the age range, with 41% under the age of 30 and 23% over the age of 49. These differences in age distributions were highly statistically significant (Pearson  $\chi^2 = 54.17$ ;  $p < 0.001$ ).

Women outnumbered male respondents in the consumer sector (54% to 46%, respectively) and constituted 38%, 16% and 7% in the industry, transport and consumer sectors. This difference was highly significant (Pearson  $\chi^2 = 50.3$ ;  $p < 0.001$ .) Differences in gender distribution by type of job was also evident (Pearson  $\chi^2 = 10.7$ ;  $p = 0.014$ ) with laboratory/health care personnel being most likely to be female (46%) and safety / shop stewards being least likely (21%) to be female.

Twelve percent of respondents were identified as having one or more forms of colour blindness<sup>4</sup> on screening (*question 2.7.1.1*). Although the percentage colour blindness differed slightly across sectors (industry: 11%, transport: 7%; agriculture: 16%; consumers: 14%), this was not statistically significant (Pearson  $\chi^2 = 3.5$ ;  $p = 0.32$ ). There were no differences in prevalence of colour blindness by job type.

Thirty-six percent (industry: 41%; transport: 29%; agriculture: 30%; consumer: 35%) of participants reported usually wearing glasses (*question 2.7.2.2*), and two-thirds (in all sectors) of these had their glasses on when tested (*question 2.7.2.1*), as a result of which, visual acuity tested on screening (*question 2.7.2.3*) was impaired in only 9% of individuals (industry: 9%; transport: 7%; agriculture: 4%; consumer: 13%).

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<sup>4</sup> The prevalence of colour blindness in the general population is approximately 12% amongst men, and 0.5% amongst women, so the results in this study are consistent, if a little higher than the general population.

<b>Table 6.1. Demographic factors</b>		Percentage
Gender (q2.2.1)	Male	68%
	Female	32%
Age (q 2.2.1)	< 20 years:	1.2%
	20 – 29 years:	21%
	30 – 39 years:	38%
	40 – 49 years:	24%
	> 49 years:	17%
Marital Status (q2.2.3)	Married	68%
Children (q2.2.4)	Have children	79%
Educational level (q2.4.1 and 2.4.2)	No Schooling:	2.5%
	Less than primary school:	11%
	High schooling:	39%
	Further education beyond school:	47%
Sectoral breakdown (identifying data module 2)	Industry	43.8%
	Transport	17.9%
	Agriculture	16.7%
	Consumer	21.6%
		100%
	Females 38%	
	Females 7%	
	Females 16%	
	Females 54%	

<b>Table 6.1.1. Demographic factors: Industry</b>		
Gender (q2.2.1)	Male	62%
	Female	38%
Age (q 2.2.1)	< 20 years:	0.6%
	20 – 29 years:	21%
	30 – 39 years:	37%
	40 – 49 years:	27%
	> 49 years:	14%
Marital Status (q2.2.3)	Married	69%
Children (q2.2.4)	Have children	78%
Educational level (q2.4.1 and 2.4.2)	No Schooling:	2.3%
	Less than primary school:	5%
	High schooling:	43%
	Further education beyond school:	50%

<b>Table 6.1.2. Demographic factors: Transport</b>		
Gender (q2.2.1)	Male	93%
	Female	7%
Age (q 2.2.1)	< 20 years:	0%
	20 – 29 years:	11%
	30 – 39 years:	44%
	40 – 49 years:	29%
	> 49 years:	15%
Marital Status (q2.2.3)	Married	71%
Children (q2.2.4)	Have children	29%
Educational level (q2.4.1 and 2.4.2)	No Schooling:	0%
	Less than primary school:	10%
	High schooling:	43%
	Further education beyond school:	47%

Gender ( <i>q2.2.1</i> )	Male	84%
	Female	16%
Age ( <i>q 2.2.1</i> )	< 20 years:	0%
	20 – 29 years:	9%
	30 – 39 years:	39%
	40 – 49 years:	36%
	> 49 years:	16%
Marital Status ( <i>q2.2.3</i> )	Married	90%
Children ( <i>q2.2.4</i> )	Have children	90%
Educational level ( <i>q2.4.1 and 2.4.2</i> )	No Schooling:	7.5%
	Less than primary school:	30%
	High schooling:	39%
	Further education beyond school:	24%

Gender ( <i>q2.2.1</i> )	Male	46%
	Female	54%
Age ( <i>q 2.2.1</i> )	< 20 years:	5%
	20 – 29 years:	37%
	30 – 39 years:	32%
	40 – 49 years:	35%
	> 49 years:	23%
Marital Status ( <i>q2.2.3</i> )	Married	49%
Children ( <i>q2.2.4</i> )	Have children	68%
Educational level ( <i>q2.4.1 and 2.4.2</i> )	No Schooling:	1%
	Less than primary school:	12%
	High schooling:	40%
	Further education beyond school:	48%

### 6.1.1 Home Language

The most commonly reported home languages (*question 2.3.2*) were Afrikaans (35% of respondents) and English (for 33%), while indigenous African languages were less commonly reported. Reported proficiency in English (*question 2.3.3*) was higher in all sectors other than for agriculture (Tables 6.3 through 6.3.4) even though home language was less unevenly distributed across sectors (Tables 6.2 through 6.2.4). Notably, even though 31% of respondents indicated their home language was other than English, only 9% reported having no proficiency in English. Agricultural respondents were more likely (Pearson  $\chi^2 = 46.68$ ;  $p < 0.001$ ) to report no proficiency in English (25% versus less than 7%) than other sectors (Tables 6.3 through 6.3.4). There were no differences in the distribution of language proficiency by job type.

Home language	Percentage	Language of interview	Percentage
English	33%	English	74%
Afrikaans	36%	Afrikaans	14%
IsiXhosa	13%	IsiXhosa	5%
Tswana	3%	Tswana	0.3%
Sotho	5%	Sotho	3%
IsiZulu	5%	IsiZulu	2%
Others	5%	Others	0.5%

Home language	Percentage	Language of interview	Percentage
English	34%	English	85%
Afrikaans	38%	Afrikaans	6%
IsiXhosa	11%	IsiXhosa	5%
Tswana	2%	Tswana	0%
Sotho	6%	Sotho	2%
IsiZulu	8%	IsiZulu	2%
Others	2%	Others	1%

Home language	Percentage	Language of interview	Percentage
English	28%	English	74%
Afrikaans	26%	Afrikaans	13%
IsiXhosa	19%	IsiXhosa	4%
Tswana	6%	Tswana	0%
Sotho	7%	Sotho	4%
IsiZulu	6%	IsiZulu	4%
Others	2%	Others	1%

Home language	Percentage	Language of interview	Percentage
English	15%	English	39%
Afrikaans	43%	Afrikaans	43%
IsiXhosa	58%	IsiXhosa	9%
Tswana	5%	Tswana	2%
Sotho	8%	Sotho	6%
IsiZulu	5%	IsiZulu	25%
Others	7%	Others	1%

Home language	Percentage	Language of interview	Percentage
English	48%	English	79%
Afrikaans	24%	Afrikaans	10%
IsiXhosa	13%	IsiXhosa	6%
Tswana	1%	Tswana	0%
Sotho	2%	Sotho	2%
IsiZulu	2%	IsiZulu	1%
Others	8%	Others	2%

<b>Table 6.3. Proficiency in English and Afrikaans as language of most labels in South Africa (q2.3.3)</b>				
		Proficient	Partly proficient	No proficiency
English	Read	69%	22%	9%
	Write	68%	21%	10%
Afrikaans	Read	65%	18%	16%
	Write	65%	19%	17%

<b>Table 6.3.1. Proficiency in English and Afrikaans as language of most labels in South Africa (q2.3.3): Industry</b>				
		Proficient	Partly proficient	No proficiency
English	Read	77%	16%	7%
	Write	76%	16%	8%
Afrikaans	Read	68%	16%	16%
	Write	68%	16%	16%

<b>Table 6.3.2. Proficiency in English and Afrikaans as language of most labels in South Africa (q2.3.3): Transport</b>				
		Proficient	Partly proficient	No proficiency
English	Read	73%	24%	3%
	Write	73%	23%	4%
Afrikaans	Read	56%	24%	19%
	Write	58%	16%	16%

<b>Table 6.3.3. Proficiency in English and Afrikaans as language of most labels in South Africa (q2.3.3): Agriculture</b>				
		Proficient	Partly proficient	No proficiency
English	Read	37%	37%	25%
	Write	37%	34%	28%
Afrikaans	Read	76%	9%	15%
	Write	73%	10%	16%

<b>Table 6.3.4. Proficiency in English and Afrikaans as language of most labels in South Africa (q2.3.3): Consumer</b>				
		Proficient	Partly proficient	No proficiency
English	Read	74%	21%	6%
	Write	75%	20%	10%
Afrikaans	Read	58%	27%	16%
	Write	55%	31%	14%

### 6.1.2 Occupational Profile

The occupational profile (*questions 2.5.2 to 2.5.4*) of respondents matched the sampling strategy largely. Fourteen percent were production workers (industry: 27%, transport: 3%, agriculture: 4%, consumers: 4%), 18% were managers or supervisors (industry: 27%, transport: 17%, agriculture: 12%, consumers: 8%), 17% skilled workers (industry: 15%, transport: 6%, agriculture: 11%, consumers: 36%), and 12% drivers (industry: 2%, transport: 44%, agriculture: 9%, consumers: 4%). Less than 4% reported being unemployed, and these 13 respondents were found amongst the 20% consumers.

Slightly over 80% of all respondents reported ever having used, or worked with, chemicals (*question 2.6.1*). Industry respondents reported the highest history of contact with chemicals (90%) compared to transport (68%), agriculture (75%) and consumers (77%) (Pearson  $\chi^2 = 20.35$ ;  $p < 0.001$ ). This picture was similar, although not exactly the same, from work histories collected from respondents (*questions*

10.2.5.1 and 10.2.5.2), which indicated that 26% of participants had never worked in a job with potential chemical exposure (Table 6). As might be anticipated, consumers were most likely (46%) to report a work history with no exposure to chemicals (Pearson  $\chi^2 = 36.94$ ;  $p < 0.001$ ). Over 80% of respondents (in all sectors) indicated that either they (*question 10.2.1*), or someone else (*question 10.2.2*) at home had used household chemicals either sometimes, or a great deal. The equivalent figure for occupational exposure in their current job (*question 10.2.3*) was 73% (industry: 82%; transport: 71%; agriculture: 81%; consumers: 49%), and 71% (industry: 83%; transport: 67%; agriculture: 73%; consumers: 49%) for exposure to chemicals handled by someone else at work (*question 10.2.4*).

Laboratory / health care workers (64%) were more likely than safety representatives / shop stewards (55%), production workers (44%) and managers (53%) to indicate that they had frequent exposure to chemicals in their current job. (Pearson  $\chi^2 = 13.6$ ;  $p = 0.035$ ). Laboratory / health care workers (57%) and safety representatives / shop stewards (58%) were more likely than production workers (35%) and managers (47%) to indicate that they had frequent exposure to chemicals as a result of some other person's exposure in their current job. (Pearson  $\chi^2 = 20.8$ ;  $p = 0.002$ )

The sample was thus a high-risk group, which is the exact target group that the GHS seeks to protect.

**Table 6.4 Work histories**

Years with potential occupational chemical exposure ( <i>q 10.2.5.1 and 10.2.5.2</i> )	None 1 – 9 years 10 – 19 years > 19 years	26% 33% 23% 18%
<b>Training in (n=377):</b> ( <i>q 10.3.1 and 10.3.2</i> )		
	In current Job	In any job, past or present
General Health and Safety	44%	66%
Labels and chemical safety	34%	48%
SDSs and chemical safety	27%	34%

**Table 6.4.1. Work histories: Industry**

Years with potential occupational chemical exposure ( <i>q 10.2.5.1 and 10.2.5.2</i> )	None 1 – 9 years 10 – 19 years > 19 years	16% 36% 30% 18%
<b>Training in (n=402):</b> ( <i>q 10.3.1 and 10.3.2</i> )		
	In current Job	In any job, past or present
General Health and Safety	54%	80%
Labels and chemical safety	41%	56%
SDSs and chemical safety	34%	44%
<b>Training in current job</b> ( <i>q 10.3.1</i> )		
	Chemical (n=82)	Non –chemical (n=83)
General Health and Safety	65%	38%
Labels & chemical safety	50%	28%
SDSs and chemical safety	48%	20%

**Table 6.4.2. Work histories: Transport**

Years with potential occupational chemical exposure (q10.2.5.1 and 10.2.5.2)	None 1 – 9 years 10 – 19 years > 19 years	35% 32% 18% 15%
Training in (n=402): (q 10.3.1 and 10.3.2)		
	In current Job	In any job, past or present
General Health and Safety	62%	96%
Labels and chemical safety	56%	86%
SDSs and chemical safety	34%	49%

**Table 6.4.3. Work histories: Agriculture**

Years with potential occupational chemical exposure (q10.2.5.1 and 10.2.5.2)	None 1 – 9 years 10 – 19 years > 20 years	20% 28% 29% 23%
Training in (n=402): (q 10.3.1 and 10.3.2)		
	In current Job	In any job, past or present
General Health and Safety	35%	59%
Labels and chemical safety	21%	34%
SDSs and chemical safety	11%	19%

**Table 6.4.4. Work histories: Consumer**

Years with potential occupational chemical exposure (q10.2.5.1 and 10.2.5.2)	None 1 – 9 years 10 – 19 years > 19 years	46% 29% 10% 16%
Training in (n=377): (q 10.3.1 and 10.3.2)		
	In current Job	In any job, past or present
General Health and Safety	16%	25%
Labels and chemical safety	12%	16%
SDSs and chemical safety	7%	11%

### 6.1.3 Previous Training

Approximately 43% of all respondents indicated they received some form of health and safety training in their current job (*question 10.3.1*). This was lower for specific training on labels and SDS's (*question 10.3.1*). No substantial differences were noted in whether training was given at induction or in-service – in general, if a person received training, it was both at induction and in-service. When asked if training had been received ever (i.e. any job in the past) the percentage reporting training increased somewhat (*question 10.3.2*). However, what is evident is that two thirds of respondents had never received training on SDS's, and more than half had never been trained on labels.

Levels of training (whether for general health and safety training, training on labels or training on SDS's) differed widely between sectors and this difference was statistically significant (for general health and safety, Pearson  $\chi^2 = 46.68$ ;  $p < 0.001$ ; similar statistical findings for label training and SDS training). The highest levels of training were evident in the industry sector (particularly chemical sub-sector) and in the transport sector. Training on general health and safety, on labels and on SDS's was reported by 62%, 56% and 34% of transport respondents, and 65%, 50% and 49% of chemical sector respondents. Sensitivity analyses excluding 6 respondents from two companies in food production that

were classified as chemical companies did not change these percentages for training levels amongst the chemical industry significantly (66%, 54% and 48%).

However, even at best, only about a half of respondents indicated receiving training on labels in their current jobs.

Very low levels of training were reported for agricultural and consumer respondents. Training on general health and safety, on labels and on SDS's was reported by 35%, 21% and 11% of agricultural respondents, and 16%, 12% and 7% of consumer respondents.

Data on "ever trained" (i.e. training received in any previous job) increased levels of training (Tables 6.4.1 through 6.4.4), although levels for agricultural and consumer respondents remained very low. For example, training ever in a lifetime on general health and safety, on labels and on SDS's was reported by 59%, 34% and 19% of agricultural respondents, and 25, 16% and 11% of consumer respondents.

Compared to the chemical sector, the non-chemical industrial sector had low rates of training (Table 6.4.1). These sub-sectors included a wide range of service and other workers who would have been unlikely to have received any training in their current employment, such as for example, 9 domestic workers. The pattern of highest rates of training evident for general health and safety, and lowest for SDS training was consistent across sectors.

About 70% of those who reported any training indicated that it was in-house training, and the quality of this training is difficult to determine. Only about 27% indicated receiving training that had some evidence of external accreditation (e.g. SETA training, NOSA, diplomas, Sertech, etc). This pattern of the kind of training (predominantly in-house and non-accredited) was broadly similar across sectors, except for consumers, where a high proportion (54%) of those reporting training, reported training that was SETA-linked, although this was based on a very small number, given the low levels of reported training in this sector.

Twenty-six percent (Industry: 34%, Transport: 22%, Agriculture: 30%, Consumer: 8%) of respondents indicated that they had ever been health and safety (H&S) representatives in any of their jobs (*question 10.4.1*), while 19% (Industry: 25%, Transport: 17%, Agriculture: 22%, Consumer: 4%) indicated being H&S representatives in their current jobs (*question 10.4.3*). Similarly, 17% (Industry: 19%, Transport: 15%, Agriculture: 27%, Consumer: 8%) of respondents indicated that they had ever been shop stewards (*question 10.4.2*) in any of their jobs, while 9% (Industry: 11%, Transport: 6%, Agriculture: 12%, Consumer: 6%) indicated being shop stewards (*question 10.4.4*) in their current jobs.

Safety representatives / shop stewards were generally more likely to report past chemical safety training than other categories of respondents. For example, safety representatives / shop stewards (65%) were about twice as likely (Pearson  $\chi^2 = 32.0$ ;  $p < 0.001$ ) to report past training on general health and safety than other production workers (32%) and supervisors/managers (47%) and laboratory/health personnel (56%) were intermediate.

## 6.2 Awareness of Labels and SDS as Hazard Communication Tools

### 6.2.1 Information Sources

Respondents were asked how they would find out about the hazards of a particular chemical with which they were in contact (*question 2.6.2*).

Unprompted, labels were cited as the most common information source of all the options listed in Table 7 through 7d below. (Industry 52%; Transport 61%; Agriculture 60%; Consumer 64%). The difference between sectors in the unprompted proportion citing a label as a source of chemical information was not large.

Labels were particularly important (64%) for consumers compared to other sources of hazard information (all other sources 8% or less). Other sectors reported source other than labels more commonly than consumers (Tables 6.5.1. through 6.5.4.).

Occupational health personnel (OHPs) and trade unions were uncommonly reported as unprompted sources of information across all four sectors (8% or less for OHPs, and 3% or less for trade unions).

After prompting, almost all categories of source increased substantially, and virtually everyone identified a label as a source of information. Safety data sheets, however, were not universally identified as an information source, and the increase after prompting for SDS's was much lower than for other categories. For example, after prompting, 60% of industry, 61% of transport, 44% of agriculture and 19% of consumer respondents identified SDS's as sources of information. The equivalent figures for labels as source of information after prompting were 98%, 97%, 94% and 94%, respectively, while co-workers were identified as sources of information by 79%, 83%, 91% and 66% of industry, transport, agriculture and consumer respondents, respectively.

The absolute increase in respondents who identified co-workers and supervisors as sources of information was highest, indicating the importance of workplace peers and colleagues as sources of information. The relatively low level of reporting of Trade Unions as a source of information, even after prompting, may be an issue the labour sector would want to address. Laboratory and health care personnel (87%) and safety representatives / shop stewards (74%) were more likely to name occupational health personnel on prompting as source of information on hazard communication than production workers (55%) or managers (67%) (Pearson  $\chi^2 = 16.8$ ;  $p=0.01$ ).

For most items on the label, there were no differences by job category as to what information was identified by respondents. Significant differences were found for only two items. Managers (79%) and safety representatives / shop stewards (76%) more likely to identify the product name on prompting than production workers (56%) or laboratory and health care personnel (67%) (Pearson  $\chi^2 = 8.62$ ;  $p=0.035$ ), whereas production workers (83%) and managers (88%) were more likely to identify hazard information on a label after prompting than laboratory and health care personnel (67%) or safety representatives / shop stewards (73%) (Pearson  $\chi^2 = 19.9$ ;  $p=0.003$ ). These data do not indicate a consistent pattern of what information was identified by respondents in different job categories.

<b>Unprompted*</b>		<b>With prompting*</b>	
Label	58%	Label	38%
SDS	15%	SDS	33%
Co-workers	8%	Co-workers	69%
Supervisors	5%	Supervisors	66%
Training	11%	Go for Training	57%
Occupational Health personnel	5%	Occupational Health Personnel	57%
Other specialist personnel	4%	Other specialist Personnel	44%
Trade Union office	2%	Trade Union office	31%
Public information service (e.g. Poison Centre)	3%	Public information service (e.g. Poison Centre)	<1%

\* Respondents may include more than one option. Column totals may therefore exceed 100%; Prompted responses are solicited where there were no prompted responses. Hence totals for unprompted and prompted responses should be summed to obtain cumulative sources of information

<b>Unprompted*</b>		<b>With prompting*</b>	
Label	52%	Label	46%
SDS	24%	SDS	36%
Co-workers	5%	Co-workers	74%
Supervisors	14%	Supervisors	74%
Training	13%	Go for Training	62%
Occupational Health personnel	5%	Occupational Health Personnel	66%
Other specialist personnel	4%	Other specialist Personnel	50%
Trade Union office	1%	Trade Union office	32%
Public information service (e.g., Poison Centre)	2%	Public information service (e.g. Poison Centre)	0%

\* Respondents may include more than one option. Column totals may therefore exceed 100%; Prompted responses are solicited where there were no prompted responses. Hence totals for unprompted and prompted responses should be summed to obtain cumulative sources of information

<b>Unprompted*</b>		<b>With prompting*</b>	
Label	61%	Label	36%
SDS	18%	SDS	43%
Co-workers	11%	Co-workers	72%
Supervisors	17%	Supervisors	75%
Training	26%	Go for Training	58%
Occupational Health personnel	8%	Occupational Health Personnel	67%
Other specialist personnel	4%	Other specialist Personnel	47%
Trade Union office	3%	Trade Union office	32%
Public information service (e.g. Poison Centre)	3%	Public information service (e.g. Poison Centre)	0%

\* Respondents may include more than one option. Column totals may therefore exceed 100%; Prompted responses are solicited where there were no prompted responses. Hence totals for unprompted and prompted responses should be summed to obtain cumulative sources of information

<b>Unprompted*</b>		<b>With prompting*</b>	
Label	60%	Label	34%
SDS	4%	SDS	40%
Co-workers	15%	Co-workers	76%
Supervisors	18%	Supervisors	73%
Training	4%	Go for Training	69%
Occupational Health personnel	4%	Occupational Health Personnel	51%
Other specialist personnel	4%	Other specialist Personnel	39%
Trade Union office	1%	Trade Union office	34%
Public information service (e.g. Poison Centre)	6%	Public information service (e.g. Poison Centre)	0%

\* Respondents may include more than one option. Column totals may therefore exceed 100%; Prompted responses are solicited where there were no prompted responses. Hence totals for unprompted and prompted responses should be summed to obtain cumulative sources of information

<b>Unprompted*</b>		<b>With prompting*</b>	
Label	64%	Label	30%
SDS	2%	SDS	17%
Co-workers	6%	Co-workers	60%
Supervisors	8%	Supervisors	47%
Training	2%	Go for Training	45%
Occupational Health personnel	3%	Occupational Health Personnel	41%
Other specialist personnel	3%	Other specialist Personnel	40%
Trade Union office	2%	Trade Union office	26%
Public information service (e.g. Poison Centre)	5%	Public information service (e.g. Poison Centre)	1%

\* Respondents may include more than one option. Column totals may therefore exceed 100%; Prompted responses are solicited where there were no prompted responses. Hence totals for unprompted and prompted responses should be summed to obtain cumulative sources of information

## 6.2.2 Familiarity with Labels and SDSs

Familiarity with labels and SDS's was tested by asking respondents (*question 3.2.1*) if they had seen a label or SDS before (Table 6.6). Transport respondents (86%) and chemical industry respondents (77%) were more likely (Pearson  $\chi^2 = 21.11$ ;  $p = 0.002$ ) to have seen a label than agricultural workers (63%) or consumers (64%). In general, labels were far more likely to have been seen, read and used than SDS's (*question 3.9.1*). Nonetheless, there appears to be a core of respondents who use SDSs regularly.

There were no differences between categories of respondents in terms of frequency of use of information from labels. However, laboratory / health care personnel (47%) and supervisors/managers (40%) were more likely (Pearson  $\chi^2 = 20.5$ ;  $p = 0.002$ ) to report using information from a SDS frequently than production workers (15%) or safety representatives / shop stewards (22%). Fewer than half of all safety representatives / shop stewards reported ever seeing an SDS previously.

		Label (n=402)	SDS (n=315)
Ever Seen ( <i>q3.2.1 and 3.9.1</i> )		73%	40%
Able to name ( <i>q3.2.2 and 3.9.2</i> )		45%	21%
Read ( <i>q3.8.1 and 3.9.3</i> )	Never	18%	46%
	Less than 10 times	30%	16%
	Many times (>10)	52%	18%
Used ( <i>q3.8.2 and 3.9.4</i> )	Never	27%	45%
	Less than 10 times	31%	15%
	Many times (>10)	42%	18%

		Label (n=176)	SDS (n=176)
Ever Seen ( <i>q3.2.1 and 3.9.1</i> )		77%	48%
Able to name ( <i>q3.2.2 and 3.9.2</i> )		50%	31%
Read ( <i>q3.8.1 and 3.9.3</i> )	Never	14%	48%
	Less than 10 times	25%	25%
	Many times (>10)	61%	27%
Used ( <i>q3.8.2 and 3.9.4</i> )	Never	11%	49%
	Less than 10 times	33%	25%
	Many times (>10)	55%	26%

		Label (n=72)	SDS (n=72)
Ever Seen ( <i>q3.2.1 and 3.9.1</i> )		86%	43%
Able to name ( <i>q3.2.2 and 3.9.2</i> )		40%	14%
Read ( <i>q3.8.1 and 3.9.3</i> )	Never	18%	57%
	Less than 10 times	25%	23%
	Many times (>10)	57%	21%
Used ( <i>q3.8.2 and 3.9.4</i> )	Never	23%	60%
	Less than 10 times	27%	15%
	Many times (>10)	50%	25%

		Label (n=67)	SDS (n=66)
Ever Seen ( <i>q3.2.1 and 3.9.1</i> )		63%	11%
Able to name ( <i>q3.2.2 and 3.9.2</i> )		34%	2%
Read ( <i>q3.8.1 and 3.9.3</i> )	Never	28%	88%
	Less than 10 times	30%	5%
	Many times (>10)	42%	8%
Used ( <i>q3.8.2 and 3.9.4</i> )	Never	14%	87%
	Less than 10 times	39%	5%
	Many times (>10)	47%	8%

		Label (n=87)	SDS (not applicable)
Ever Seen ( <i>q3.2.1 and 3.9.1</i> )		64%	
Able to name ( <i>q3.2.2 and 3.9.2</i> )		48%	
Read ( <i>q3.8.1 and 3.9.3</i> )	Never	18%	
	Less than 10 times	48%	
	Many times (>10)	33%	
Used ( <i>q3.8.2 and 3.9.4</i> )	Never	18%	
	Less than 10 times	45%	
	Many times (>10)	37%	

Respondents were asked whom they thought a SDS is intended for (*question 3.9.6*). The majority (80%) responded that it was intended for all persons working with, or in contact with chemicals. Less common understandings were supervisors or managers (11%), driver (5%), health care professionals (3%) and laboratory staff (3%). Only 2% of respondents cited shop stewards or safety representatives. Transport respondents were more likely to be the respondent category to cite specifically drivers (92%) than to indicate "all persons" (15%) as targets for the SDS (Pearson  $\chi^2 = 107.74$ ;  $p < 0.001$ ). There were no differences in which respondents thought an SDS was intended for across different categories of jobs.

SDS's appeared more likely than labels to be read with a view to use, since the percentage distribution of readers and users of SDSs were almost identical, whereas usage of labels was lower than reading (Tables 6.6 through 6.6.3).

### 6.3 Recall of Label Elements

Respondents were given a label to examine for a minute and then asked to return the label, after which their recall of label elements was asked, unprompted and then prompted (Tables 6.7 through 6.7.4.).

<b>Table 6.7. Total. Recall of label elements</b>		
<i>(q 3.3.1 and 3.3.2)</i>	Without prompts	After prompting
Correct chemical name	29%	73%
Skull and crossbones symbol	80%	96%
Flammable symbol	65%	91%
Environmental hazard symbol	50%	78%
Signal word: Danger or Warning	40%	44%
Active ingredient acetone	22%	44%
At least one of the hazard statements	33%	82%
At least one first aid measure	30%	49%
Emergency contact phone number	22%	74%
Use of protective clothing	24%	76%

<b>Table 6.7.1. Recall of label elements: Industry</b>		
<i>(q 3.3.1 and 3.3.2)</i>	Without prompts	After prompting
Correct chemical name	28%	60%
Skull and crossbones symbol	72%	94%
Flammable symbol	59%	92%
Environmental hazard symbol	45%	74%
Signal word: Danger or Warning	41%	85%
Active ingredient acetone	30%	70%
At least one of the hazard statements	38%	84%
At least one first aid measure	34%	48%
Emergency contact phone number	30%	82%
Use of protective clothing	28%	78%

<b>Table 6.7.2. Recall of label elements: Transport</b>		
<i>(q 3.3.1 and 3.3.2)</i>	Without prompts	After prompting
Correct chemical name	33%	33%
Skull and crossbones symbol	76%	94%
Flammable symbol	57%	90%
Environmental hazard symbol	44%	66%
Signal word: Danger or Warning	36%	90%
Active ingredient acetone	18%	75%
At least one of the hazard statements	25%	88%
At least one first aid measure	35%	84%
Emergency contact phone number	30%	83%
Use of protective clothing	28%	86%

<b>Table 6.7.3. Recall of label elements: Agriculture</b>		
<i>(q 3.3.1 and 3.3.2)</i>	Without prompts	After prompting
Correct chemical name	22%	56%
Skull and crossbones symbol	93%	99%
Flammable symbol	70%	94%
Environmental hazard symbol	60%	84%
Signal word: Danger or Warning	40%	79%
Active ingredient acetone	9%	54%
At least one of the hazard statements	21%	82%
At least one first aid measure	24%	69%
Emergency contact phone number	15%	66%
Use of protective clothing	18%	66%

<b>Table 6.7.4. Recall of label elements: Consumer</b>		
<i>(q 3.3.1 and 3.3.2)</i>	Without prompts	After prompting
Correct chemical name	33%	58%
Skull and crossbones symbol	89%	99%
Flammable symbol	82%	96%
Environmental hazard symbol	56%	22%
Signal word: Danger or Warning	39%	78%
Active ingredient acetone	21%	63%
At least one of the hazard statements	38%	79%
At least one first aid measure	22%	74%
Emergency contact phone number	8%	59%
Use of protective clothing	18%	69%

### 6.3.1 Symbols

The symbols were by far the items on the label most commonly recalled, and the frequency of symbol recall was highest for the skull and crossbones, next the flammable symbol, and lastly the environmental hazard symbol consistently across all sectors (Tables 6.7.1. to 6.7.2.).

After prompting, both the flammable and skull and crossbones symbols were almost universally recognised. The environment hazard icon was 'overtaken' by other hazard communication elements after prompting in all sectors.

There appeared to be little difference in patterns of recall across different sectors (Pearson  $\chi^2 = 6.3$ ;  $p = 0.389$  for the skull and crossbones; Pearson  $\chi^2 = 9.7$ ;  $p = 0.373$  for flammable) and sub-sectors (e.g. chemical versus non-chemical) (Pearson  $\chi^2 = 11.6$ ;  $p = 1.000$ ; and Pearson  $\chi^2 = 77.6$ ;  $p = 0.396$ , respectively). Similarly, there were no differences across category of job for symbol recall.

Almost all items for which there was low unprompted recall (less than 35%) were commonly remembered after prompting. For example, only a third of respondents cited any hazard statement unprompted but over 80% could identify a hazard statement after prompting. Patterns were similar across sectors.

Mistaken recall was uncommon and only a small number of respondents ( $n=6$ ) mistakenly identified the company name as the chemical.

### 6.3.2 Sequence of Reading Label Elements

Respondents were asked to identify the sequence in which they read the elements on the label (*question 3.4.1*). The symbols, particularly the skull and crossbones and flammable symbols were reported most commonly as read either first, second or third. The two symbols were also most commonly read at any rank, consistent with the data from recall of label items above. The three symbols all scored higher than other label elements. This particularly strong for the skull and crossbones, reflecting both frequent recall (column "any rank" in Tables 6.8 through 6.8.4) AND high ranking (columns "first" and "second or third" in Table 6.8 through 6.8.4) of recall.

	Ranking#			
	First	Second or third	Any rank	Mean score*
Correct chemical name	19%	11%	47%	14.3
Skull and crossbones symbol	54%	19%	84%	26.1
Flammable symbol	5%	52%	76%	22.9
Environmental hazard symbol	4%	38%	68%	20.0
Signal word: Danger or Warning	10%	17%	54%	14.8
Active ingredient acetone	37%	9%	33%	9.5
Emergency contact phone number	2%	3%	24%	6.7
Use of protective clothing	1%	2%	10%	2.6

# ranking percentage as row percentage;

\* Mean score calculated as  $\epsilon(32 - \text{rank})/402$ .

	Ranking#			
	First	Second or third	Any rank	Mean score*
Correct chemical name	20%	11%	43%	13.2
Skull and crossbones symbol	47%	19%	82%	25.4
Flammable symbol	9%	41%	69%	20.7
Environmental hazard symbol	6%	27%	59%	17.2
Signal word: Danger or Warning	13%	15%	58%	17.1
Active ingredient acetone	6%	16%	41%	12.0
Emergency contact phone number	2%	4%	32%	8.9
Use of protective clothing	1%	2%	11%	3.1

# ranking percentage as row percentage; \* Mean score calculated as  $\epsilon(32 - \text{rank})/162$ .

	Ranking#			
	First	Second or third	Any rank	Mean score*
Correct chemical name	18%	13%	51%	15.4
Skull and crossbones symbol	22%	17%	81%	25.2
Flammable symbol	1%	57%	79%	23.6
Environmental hazard symbol	0%	35%	71%	20.7
Signal word: Danger or Warning	8%	22%	60%	17.8
Active ingredient acetone	3%	6%	32%	9.1
Emergency contact phone number	0%	1%	26%	7.1
Use of protective clothing	0%	1%	11%	3.1

# ranking percentage as row percentage;

\* Mean score calculated as  $\varepsilon(32 - \text{rank})/72$ .

	Ranking#			
	First	Second or third	Any rank	Mean score*
Correct chemical name	15%	7%	40%	12.0
Skull and crossbones symbol	69%	19%	93%	29.2
Flammable symbol	6%	61%	84%	25.2
Environmental hazard symbol	6%	48%	76%	22.5
Signal word: Danger or Warning	10%	16%	52%	15.5
Active ingredient acetone	0%	2%	12%	3.3
Emergency contact phone number	3%	6%	27%	7.5
Use of protective clothing	2%	0%	8%	2.9

# ranking percentage as row percentage;

\* Mean score calculated as  $\varepsilon(32 - \text{rank})/67$ .

	Ranking#			
	First	Second or third	Any rank	Mean score*
Correct chemical name	25%	13%	75%	17.4
Skull and crossbones symbol	57%	20%	83%	26.0
Flammable symbol	1%	63%	83%	24.9
Environmental hazard symbol	1%	53%	94%	23.1
Signal word: Danger or Warning	6%	19%	43%	12.5
Active ingredient acetone	2%	4%	34%	9.6
Emergency contact phone number	0%	1%	3%	1.0
Use of protective clothing	0%	2%	5%	1.8

# ranking percentage as row percentage;

\* Mean score calculated as  $\varepsilon(32 - \text{rank})/87$ .

Agricultural respondents (69%) and consumers (57%) tended to list the skull and crossbones as the item first read more often than industrial workers (47%) or transport workers (22%) (Pearson  $\chi^2 = 17.5$ ;  $p = 0.007$ ). Consumers were the only sector to cite the environmental hazard symbol at any rank more often (94%) than any other hazard communication element. This probably reflects a different 'culture' of hazard interpretation in these sectors.

## 6.4 Perceived Hazardousness

Perception of hazardousness (*question 3.5.1*) for the two labels in module 3 was high. Eighty percent of all respondents indicated the label was very hazardous. Hazard perception was slightly higher for agricultural (88%) and transport workers (83%) than for industry (77%) and consumers (79%) but this was not statistically significant (Pearson  $\chi^2 = 4.6$ ;  $p = 0.601$ ).

Perception of hazard increased to 99% (industry: 99%, transport: 96%, agriculture: 100%, and consumers: 100%) when asked how hazardous the chemical represented by the label was for a child (*question 3.5.3*). Only 4, and 2 persons, respectively, felt the chemical was not hazardous at all to themselves, or to children, and these respondents came from the non-chemical industry sector (2), transport (1) and consumer (1). These were respondents who indicated they were familiar with acetone and believed it to be a commonly used and therefore relatively safe chemical.

Reasons given (*question 3.5.2*) why respondents perceived the chemical as hazardous are given in Tables 6.9 through 6.9.4. Symbols were the most commonly reported item that respondents gave as the reason for their identification of the high hazard of the chemical.

<b>Table 6.9. Categories of reasons given for perceived hazardousness of chemical (q3.5.2)</b>	
Presence of:	Percentage
Hazard identification information	14%
Symbols	53%
Signal words	18%
Hazard statement	19%
First aid and treatment information	2%
Health effects information	14%
All the information on the label	3%

\* Subjects could respond with more than one option.  
Totals therefore may > 100%

<b>Table 6.9.1. Categories of reasons given for perceived hazardousness of chemical (q3.5.2): Industry</b>	
Presence of:	Percentage
Hazard identification information	17%
Symbols	45%
Signal words	16%
Hazard statement	20%
First aid and treatment information	3%
Health effects information	14%
All the information on the label	3%

\* Subjects could respond with more than one option.  
Totals therefore may > 100%

<b>Table 6.9.2. Categories of reasons given for perceived hazardousness of chemical (q3.5.2): Transport</b>	
Presence of:	Percentage
Hazard identification information	11%
Symbols	51%
Signal words	6%
Hazard statement	21%
First aid and treatment information	1%
Health effects information	26%
All the information on the label	1%

\* Subjects could respond with more than one option.  
Totals therefore may > 100%

Presence of:	Percentage
Hazard identification information	18%
Symbols	52%
Signal words	31%
Hazard statement	13%
First aid and treatment information	2%
Health effects information	21%
All the information on the label	0%

\* Subjects could respond with more than one option.

Totals therefore may > 100%

Presence of:	Percentage
Hazard identification information	9%
Symbols	72%
Signal words	13%
Hazard statement	20%
First aid and treatment information	3%
Health effects information	11%
All the information on the label	1%

\* Subjects could respond with more than one option.

Totals therefore may > 100%

Later in the interview, respondents (other than consumers) were given an SDS for the same active ingredient as that on the label, but with a different trade name, and asked how hazardous the chemical was (*question 8.3.1*). Rating of hazardousness was high (90% overall, with industry: 93%, transport: 94%, agriculture 83; consumers 100%) and similar to that for the label. The frequency with which health hazards were identified as associated with the chemical (*question 8.3.2*) varied widely from 0.2% (environmental damage and nausea) to 52% for skin irritation, which was the most commonly cited health hazard for all sectors except consumers.

Consumers were less likely to identify hazards to skin (16% versus over 50% for the other sectors), and more likely to identify respiratory hazards (29% versus less than 11% for other sectors) and ocular (eye) hazards (23% versus less than 6% for other sectors). (Pearson  $\chi^2 = 135.78$ ;  $p < 0.001$ ).

Twenty respondents (5% of all respondents) identified a hazard that was not explicitly listed such as cancer, or unrelated conditions. These were evenly distributed across industry, transport and agriculture. Eighteen respondents simply cited general illness or fatality.

## 6.5 Identifying information from a label and SDS

All respondents were given a label, and industry, transport and agricultural workers an SDS. The majority of respondents (80% of industry, 69% of transport, 75% of agriculture and 61% of consumers) could correctly identify the name of the chemical on the label (*question 3.10.2*), but 46% required an explanation of the difference between a trade name and an active ingredient (Industry: 40%, transport: 54%, agriculture: 52%, consumers 46%). Twenty-one percent of all respondents (industry: 15 %, transport: 24%, agriculture: 11%, consumer: 39%) could not identify the chemical, and 6% (industry: 6 %, transport: 7%, agriculture: 15%, consumer: 0%) were unsure. Findings were similar for SDSs (*question 8.2*) where 11% of respondents could not identify the chemical (industry: 10 %, transport: 7%, agriculture: 7%).

Respondents in industry, transport and agriculture were asked to identify health hazards (*question 3.10.3*), physical hazards<sup>5</sup> (*question 3.10.4*), actions to be taken in the event of spillage (*question 3.10.5*), protective clothing use (*question 3.10.6*) and storage directions (*question 3.10.7*) associated with the chemical, from an SDS. This was an unprompted question to test how well they were able to use the hazard communication material to identify information.

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<sup>5</sup> Many people did not understand what was meant by a “physical” hazard and answered in terms of health hazards. Alternatively, for those respondents for whom the questionnaire had to be administered in an indigenous language, the translation resulted in the answer being made obvious. The question therefore lost its discriminatory ability on translation.

<b>Table 6.10. Total. Frequency with which information on a SDS was identified* (q 3.10.3-3.10.7)</b>	
<b>Health hazards:</b>	
Irritation of respiratory tract	5%
Coughing, dizziness, dullness, headache	14%
CNS depression, narcosis, unconsciousness	13%
Abdominal pain, nausea, vomiting	14%
Severe lung damage	18%
Redness, pain, drying and cracking of skin	29%
Eye irritation, stinging, tearing, redness and pain	48%
Severe irritation or dermatitis	13%
Alcohol aggravates toxic effect	7%
<b>Physical hazards:</b>	
Fire - extremely flammable liquid and vapour	43%
Flash-fire - vapour may ignite	19%
<b>Spillage and Clean up:</b>	
Ventilate area of leak	17%
Remove all sources of ignition	20%
Wear personal protective equipment	29%
Isolate hazard area	24%
Keep unnecessary/unprotected personnel from entering	18%
Contain and recover liquid when possible	14%
Use non-sparking tools and equipment	13%
Collect liquid in appropriate container or absorb with inert material	16%
Place in chemical waste container	9%
Do not use combustible materials	10%
Do not flush to sewer	11%
If no fire, use water spray to disperse vapours/protect personnel/flush spills	24%
Solvent adsorbent should be used	9%
<b>Protective Clothing:</b>	
If exposure limit is exceeded – half-face organic vapour respirator	14%
Emergencies – full-face organic vapour respirator	20%
Emergencies/levels not known – full-face positive-pressure, air-supplied respirator	16%
Impervious protective clothing – boots, gloves, lab coat, apron or coveralls to prevent skin contact	70%
Chemical safety goggles and/or full-face shield where splashing could occur	11%
Maintain eye wash fountain and quick-drench facilities	31%
<b>Storage</b>	
Protect against physical damage	12%
Store in cool, dry, well-ventilated location away from fire hazard	54%
Outside and detached storage preferable	16%
Separate from incompatibles	14%
Containers bonded and grounded for transfers to avoid static sparks	16%
Store in No Smoking areas	26%
Use non-sparking tools and equipment and explosion-proof ventilation	15%
Empty containers may be hazardous	9%
Observe all warnings and precautions listed for this product	

\* Subjects could respond with more than one option. Totals therefore may > 100%

<b>Table 6.10.1. Frequency with which information on a SDS was identified* (q 3.10.3-3.10.7): Industry</b>	
<b>Health hazards:</b>	
Irritation of respiratory tract	3%
Coughing, dizziness, dullness, headache	17%
CNS depression, narcosis, unconsciousness	17%
Abdominal pain, nausea, vomiting	22%
Severe lung damage	22%
Redness, pain, drying and cracking of skin	36%
Eye irritation, stinging, tearing, redness and pain	63%
Severe irritation or dermatitis	17%
Alcohol aggravates toxic effect	10%
<b>Physical hazards:</b>	
Fire - extremely flammable liquid and vapour	52%
Flash-fire - vapour may ignite	24%
<b>Spillage and Clean up</b>	
Ventilate area of leak	23%
Remove all sources of ignition	29%
Wear personal protective equipment	35%
Isolate hazard area	30%
Keep unnecessary/unprotected personnel from entering	24%
Contain and recover liquid when possible	22%
Use non-sparking tools and equipment	19%
Collect liquid in appropriate container or absorb with inert material	24%
Place in chemical waste container	14%
Do not use combustible materials	16%
Do not flush to sewer	16%
If no fire, use water spray to disperse vapours/protect personnel/flush spills	36%
Solvent adsorbent should be used	15%
<b>Protective Clothing</b>	
If exposure limit is exceeded – half-face organic vapour respirator	17%
Emergencies – full-face organic vapour respirator	29%
Emergencies/levels not known – full-face positive-pressure, air-supplied respirator	23%
Impervious protective clothing – boots, gloves, lab coat, apron or coveralls to prevent skin contact	92%
Chemical safety goggles and/or full-face shield where splashing could occur	17%
Maintain eye wash fountain and quick-drench facilities	40%
<b>Storage</b>	
Protect against physical damage	17%
Store in cool, dry, well-ventilated location away from fire hazard	72%
Outside and detached storage preferable	26%
Separate from incompatibles	21%
Containers bonded and grounded for transfers to avoid static sparks	22%
Store in No Smoking areas	34%
Use non-sparking tools and equipment and explosion-proof ventilation	19%
Empty containers may be hazardous	9%
Observe all warnings and precautions listed for this product	

\* Subjects could respond with more than one option. Totals therefore may > 100%

<b>Table 6.10.2. Frequency with which information on a SDS was identified* (q 3.10.3-3.10.7): Transport</b>	
<b>Health hazards:</b>	
Irritation of respiratory tract	3%
Coughing, dizziness, dullness, headache	21%
CNS depression, narcosis, unconsciousness	18%
Abdominal pain, nausea, vomiting	17%
Severe lung damage	25%
Redness, pain, drying and cracking of skin	36%
Eye irritation, stinging, tearing, redness and pain	61%
Severe irritation or dermatitis	17%
Alcohol aggravates toxic effect	10%
<b>Physical hazards:</b>	
Fire - extremely flammable liquid and vapour	64%
Flash-fire - vapour may ignite	33%
<b>Spillage and Clean up</b>	
Ventilate area of leak	19%
Remove all sources of ignition	24%
Wear personal protective equipment	38%
Isolate hazard area	36%
Keep unnecessary/unprotected personnel from entering	24%
Contain and recover liquid when possible	15%
Use non-sparking tools and equipment	13%
Collect liquid in appropriate container or absorb with inert material	18%
Place in chemical waste container	8%
Do not use combustible materials	13%
Do not flush to sewer	13%
If no fire, use water spray to disperse vapours/protect personnel/flush spills	25%
Solvent adsorbent should be used	10%
<b>Protective Clothing</b>	
If exposure limit is exceeded – half-face organic vapour respirator	17%
Emergencies – full-face organic vapour respirator	26%
Emergencies/levels not known – full-face positive-pressure, air-supplied respirator	18%
Impervious protective clothing – boots, gloves, lab coat, apron or coveralls to prevent skin contact	93%
Chemical safety goggles and/or full-face shield where splashing could occur	14%
Maintain eye wash fountain and quick-drench facilities	42%
<b>Storage</b>	
Protect against physical damage	17%
Store in cool, dry, well-ventilated location away from fire hazard	75%
Outside and detached storage preferable	18%
Separate from incompatibles	14%
Containers bonded and grounded for transfers to avoid static sparks	22%
Store in No Smoking areas	33%
Use non-sparking tools and equipment and explosion-proof ventilation	21%
Empty containers may be hazardous	18%
Observe all warnings and precautions listed for this product	

\* Subjects could respond with more than one option. Totals therefore may > 100%

<b>Table 6.10.3. Frequency with which information on a SDS was identified* (q 3.10.3-3.10.7): Agriculture</b>	
<b>Health hazards:</b>	
Irritation of respiratory tract	15%
Coughing, dizziness, dullness, headache	19%
CNS depression, narcosis, unconsciousness	16%
Abdominal pain, nausea, vomiting	8%
Severe lung damage	21%
Redness, pain, drying and cracking of skin	40%
Eye irritation, stinging, tearing, redness and pain	57%
Severe irritation or dermatitis	16%
Alcohol aggravates toxic effect	3%
<b>Physical hazards:</b>	
Fire - extremely flammable liquid and vapour	55%
Flash-fire - vapour may ignite	18%
<b>Spillage and Clean up</b>	
Ventilate area of leak	18%
Remove all sources of ignition	21%
Wear personal protective equipment	43%
Isolate hazard area	25%
Keep unnecessary/unprotected personnel from entering	18%
Contain and recover liquid when possible	10%
Use non-sparking tools and equipment	13%
Collect liquid in appropriate container or absorb with inert material	16%
Place in chemical waste container	8%
Do not use combustible materials	5%
Do not flush to sewer	10%
If no fire, use water spray to disperse vapours/protect personnel/flush spills	19%
Solvent adsorbent should be used	5%
<b>Protective Clothing</b>	
If exposure limit is exceeded – half-face organic vapour respirator	22%
Emergencies – full-face organic vapour respirator	16%
Emergencies/levels not known – full-face positive-pressure, air-supplied respirator	16%
Impervious protective clothing – boots, gloves, lab coat, apron or coveralls to prevent skin contact	79%
Chemical safety goggles and/or full-face shield where splashing could occur	11%
Maintain eye wash fountain and quick-drench facilities	33%
<b>Storage</b>	
Protect against physical damage	13%
Store in cool, dry, well-ventilated location away from fire hazard	55%
Outside and detached storage preferable	11%
Separate from incompatibles	13%
Containers bonded and grounded for transfers to avoid static sparks	16%
Store in No Smoking areas	28%
Use non-sparking tools and equipment and explosion-proof ventilation	21%
Empty containers may be hazardous	8%
Observe all warnings and precautions listed for this product	

\* Subjects could respond with more than one option. Totals therefore may > 100%

Approximately 60% of respondents (industry 66%; transport 65% and agriculture 40%) made use of the label in identifying the information, while fewer (industry 29%, transport 28% and agriculture 21%) used the SDS (*questions 3.10.3-3.10.7*). However, even when using the label or SDS, it was dearto

interviewers that few participants did anything more than merely glance at the documents in front of them. The estimates above therefore probably represent over-estimations<sup>6</sup>.

Respondents also falsely identify hazards that were not present on the hazard communication material. For example, 13% of respondents, when asked about health hazards (*question 3.10.3*), volunteered reproductive or carcinogenic effects even though these were not listed as health hazards. The percentage of 'false positives' depended on the nature of the information being sought, from about 20% for physical hazards (*question 3.10.3*), to 43% for health hazards (*question 3.10.2*). Correct identification of information was highest (92% for industry; 93% for transport and 79% for agriculture) for personal protective clothing<sup>7</sup> (*question 3.10.6*).

## 6.6 Comprehension of Label Elements

As indicated above, comprehension of label elements was analysed for the proportion of correct, partly correct and incorrect answers. In addition, analyses identified where there were critical confusions, and the proportion of respondents who were unable to answer.

### 6.6.1 Symbols

Respondents were asked about symbols in two ways:

- to explain the meaning of a symbol present on a label (*questions 3.6.1 and 4.2.2*)
- to identify the correct symbol to denote a particular hazard (*question 5.1.1 to 5.1.10*)

Tables 6.11 through 6.11.4 list comprehension findings for 11 symbols used in the GHS based on questions 3.6.1 and 4.2.2, which asked respondent to identify the meaning of a particular symbol on a label.

Consistent with other research findings, the skull and crossbones fared best and was almost universally understood. Correct or partly correct responses were in excess of 96% for all sectors, and were 100% for transport respondents.

The flammable symbol also performed well (upward of 89% correct or partly correct across all sectors) and the explosive symbol (correct or partly correct between 44% and 71% for different sectors), and the environmental symbol (correct or partly correct between 50% and 58% for different sectors) performed adequately but at a lower degree of comprehensibility.

In contrast, many of the health-related symbols did not perform well, particularly those related to long-term health effects.

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<sup>6</sup> However, it should also be noted that a minority of subjects were very serious about use of the SDS, including some who were relatively unschooled in hazard communication. Two community garden farmers paged through the SDS very carefully, even though they had never seen the material before and clearly made serious use of the SDS to answer the question.

<sup>7</sup> The SDS recommended 'Impervious protective clothing – boots, gloves, lab coat, apron or coveralls to prevent skin contact.'

	Comprehension				
	Correct	Partly correct	Incorrect	Critical confusion	Doesn't know
Corrosive to skin and metal	22%	31%	26%	6%	16%
Skull and crossbones symbol	81%	17%*	1%	1%	0.3%
Flammable symbol	61%	32%	5%	0.3%	2%
Environmental hazard symbol	39%	17%	15%	4%	26%
Explosive	54%	4%	22%	2%	19%
Oxidising	8%	35%	50%	1%	6%
Acute health hazard	1%	27%	39%	3%	30%
Skin irritant	19%	35%	27%	2%	18%
Reproductive health effects	19%	14%	44%	1%	22%
Carcinogenic	16%	12%	41%	1%	31%
Chronic <sup>§</sup>	19%	3%	65%	0.3%	13%
Compressed gas	7%	7%	28%	7%	51%

\* includes 19 respondents who associated this symbol with death

§ comprehension of the chronic symbol alone (without text indicating the specific effect) is estimated from 206 respondents without any explanatory 'training'

	Comprehension				
	Correct	Partly correct	Incorrect	Critical confusion	Doesn't know
Corrosive to skin and metal	30%	31%	17%	5%	18%
Skull and crossbones symbol	82%	16%*	1%	1%	1%
Flammable symbol	63%	32%	5%	-	1%
Environmental hazard symbol	40%	17%	11%	5%	27%
Explosive	56%	2%	21%	3%	19%
Oxidising	10%	36%	46%	1%	7%
Acute health hazard	1%	29%	35%	3%	32%
Skin irritant	26%	35%	22%	2%	15%
Reproductive health effects	26%	18%	38%	1%	18%
Carcinogenic	22%	15%	36%	-	27%
Chronic <sup>§</sup>	20%	2%	66%	-	12%
Compressed gas	6%	6%	20%	10%	59%

\* includes 7 respondents who associated this symbol with death

§ comprehension of the chronic symbol alone (without text indicating the specific effect) is estimated from 77 respondents without any explanatory 'training'

	Comprehension				
	Correct	Partly correct	Incorrect	Critical confusion	Doesn't know
Corrosive to skin and metal	28%	21%	39%	3%	10%
Skull and crossbones symbol	76%	24%*	-	-	-
Flammable symbol	65%	26%	7%	1%	-
Environmental hazard symbol	39%	15%	19%	3%	24%
Explosive	44%	7%	29%	-	19%
Oxidising	11%	25%	63%	-	1%
Acute health hazard	3%	18%	49%	3%	28%
Skin irritant	8%	43%	28%	3%	18%
Reproductive health effects	11%	11%	57%	-	21%

Carcinogenic	10%	7%	56%	-	28%
Chronic <sup>\$</sup>	18%	-	67%	1%	14%
Compressed gas	19%	11%	32%	4%	33%

\* includes 3 respondents who associated this symbol with death

\$ comprehension of the chronic symbol alone (without text indicating the specific effect) is estimated from 59 respondents without any explanatory 'training'

	Comprehension				
	Correct	Partly correct	Incorrect	Critical confusion	Doesn't know
Corrosive to skin and metal	13%	31%	37%	11%	8%
Skull and crossbones symbol	81%	15%*	3%	-	-
Flammable symbol	58%	31%	6%	-	5%
Environmental hazard symbol	27%	27%	22%	5%	19%
Explosive	36%	8%	30%	6%	21%
Oxidising	9%	31%	54%	2%	5%
Acute health hazard	-	28%	37%	5%	30%
Skin irritant	22%	13%	37%	3%	24%
Reproductive health effects	6%	6%	67%	5%	16%
Carcinogenic	5%	8%	58%	3%	27%
Chronic <sup>\$</sup>	24%	6%	69%	-	23%
Compressed gas	2%	8%	34%	6%	51%

\* includes 5 respondents who associated this symbol with death

\$ comprehension of the chronic symbol alone (without text indicating the specific effect) is estimated from 32 respondents without any explanatory 'training'

	Comprehension				
	Correct	Partly correct	Incorrect	Critical confusion	Doesn't know
Corrosive to skin and metal	8%	39%	25%	6%	22%
Skull and crossbones symbol	83%	15%*	-	1%	-
Flammable symbol	59%	38%	2%	-	1%
Environmental hazard symbol	45%	13%	12%	1%	30%
Explosive	70%	1%	12%	-	17%
Oxidising	2%	43%	46%	1%	8%
Acute health hazard	-	30%	39%	1%	30%
Skin irritant	12%	43%	28%	-	18%
Reproductive health effects	21%	15%	28%	1%	36%
Carcinogenic	16%	15%	23%	1%	45%
Chronic <sup>\$</sup>	13%	5%	60%	-	23%
Compressed gas	1%	4%	38%	6%	52%

\* includes 4 respondents who associated this symbol with death

\$ comprehension of the chronic symbol alone (without text indicating the specific effect) is estimated from 38 respondents without any explanatory 'training'

### The Skull and Crossbones (question 3.6.1)

Comprehension of this symbol was uniformly high.

Nineteen respondents associated this symbol with death, which was treated as a partially correct response. However, from a GHS perspective, this is not a satisfactory understanding of the symbol.

Another common partly correct response was where respondents thought the symbol denoted poison, as was typical of icons of old-style pharmaceuticals or vermin control.

Incorrect responses associated with symbol with 'shocking'; 'pirates'; 'don't touch anything when you see this sign'; 'If in contact with the skin it can remove bones.'

Comprehension of this symbol was very similar across sectors.  
Critical confusions were very low.

#### **Flammable Symbol (question 3.6.1)**

Comprehension of this symbol was very high and was similar across sectors.  
Critical confusions were extremely low.

However, when comprehension of this symbol was asked a different way, results were slightly different.

When asked **what the respondent should do** if he or she saw this symbol (*question 5.2.1*), 85% gave an answer that denoted an appropriate action (e.g. avoid fire, don't smoke, etc). Four percent gave incorrect answers, and 13 respondents (3%) gave answers that were critical confusions: e.g. 'Fire needed near the chemical.' Agricultural workers (4%) had the highest rate of critical confusions although the numbers are too low for statistical significance.

When respondents were asked **what they should NOT do** (*question 5.2.2*) when faced with this symbol, 17 subjects (4%) produced critical confusions. Transport workers were most likely to report these critical confusions (8%). There was a higher percentage of critical confusions amongst laboratory / health care workers (15%) than others (<5%) (Pearson  $\chi^2 = 23.2$ ;  $p=0.026$ ).

#### **Corrosive to Metal and Skin Symbol (question 4.2.2)**

For all sectors except industry, the proportion of respondents who did not know what this symbol meant, or who were incorrect, was approximately similar to those who were correct or partly correct (Tables 6.11.2 to 6.11.4.) For industry respondents who were partly or completely correct (61%) outnumbered those who were incorrect or didn't know (35%).

Where respondents correctly identified the corrosive hazard, it was rarely in relation to metal but usually in relation to human skin. Incorrect responses included: 'flammable', 'try to make fire'; 'Person fainted'; 'Liquid gas'

The highest percentage of critical confusions for corrosive were reported by supervisors / managers (10%) and laboratory / health care workers (14%) compared to production workers (4%) and safety representatives / shop stewards (4%) (Pearson  $\chi^2 = 28.9$ ;  $p=0.004$ ).

#### **Explosive Symbol (question 4.2.2)**

Agricultural workers (44%) reported the lowest percentage of correct or partly correct, whereas consumers had the highest correct reports (71%).  
Incorrect reports constituted 19% of industry responses, 29% for transport, 30% in agriculture and 12% amongst consumers.

Typical incorrect associations with the explosive symbol included associating the image with danger when the product is spilled (n=3); splashing (n=2); sparking or electrical images (n=3) or flammability.

**Acute Hazard Symbol (question 4.2.2)**

Few respondents were able to identify this symbol correctly (under 3% in all sectors) and positive responses were usually partly correct (varied between 18% and 30% across sectors). The majority of respondents were incorrect or did not know what this symbol meant.

Partially correct answers almost always indicated a sense of warning such as "warning", "watch out", "caution", "be alert" or something similar.

Incorrect responses included identifying the icon with traffic warning signs (e.g. caution, danger ahead; stop sign; information sign), or literally as a punctuation mark (indicating 'Anything can happen!'). Other responses included: 'a chemical falling on person'; 'Something falling from sky'; 'A water drop' or 'dangerous water'; 'matches'; 'spillage'. Another set of incorrect answers identified the symbol as indicating the need to read a warning note, or check information before proceeding or as a thinking sign.

**Acute Skin Irritant Symbol (question 4.2.2)**

The symbol for acute skin irritation is the same acute hazard symbol but includes a piece of text indicating skin irritation.

Comprehensibility for this symbol was higher (generally over 50% for correct and partly correct) than for the acute hazard symbol alone, presumably because of the presence of the text 'skin irritant.' However, agricultural workers showed lower comprehension (35% correct or partly correct) presumably because of lower literacy and language difficulties.

Partly correct responses were mainly where respondents correctly identified "skin irritant", but had previously identified the acute symbol incorrectly. For example, many respondents, when faced with the acute symbol without text, said this indicated "caution", etc. Their comprehension of the acute skin irritant symbol was therefore almost all attributable to their ability to read the words 'skin irritant' under the symbol, rather than the symbol itself. Only one respondent explicitly complained why 'skin irritant' and 'reproductive' were written under the symbol and did not relate the wording to the symbol.

**Environmental Hazard Symbol (question 3.6.1)**

Correct or partly correct answers were reported by more than 50% of participants, irrespective of sector. Respondents reporting that they did not know what this symbol meant varied from 19% (agriculture) to 30% (consumer).

Incorrect answers were an important source of error for this symbol and included:

'First aid'; 'No fishing'; 'Fish in the water is dangerous'; 'Dangerous' or 'Dangerous for children to climb trees'; 'Do not play with fishes'; 'Shallow dam'; 'Not drinkable or eatable'; 'Don't sit under naked trees'; 'n Boom en 'n krokodiljtie (a tree and a small crocodile); 'The fish in the water is dangerous'; 'Decontamination'; 'Life.'

A key critical confusion reported by three respondents was that it denoted 'here you can catch fish', or 'fishes were available for catching.' A number of respondents were unable to find meaning in the symbol and simply reported a literal description of what they saw – 'A tree and a fish', or 'a lifeless tree and fish'; 'fire and plants'; 'fish in the river bank'; and 'fish and a tree.'

**Chronic Hazard Symbol (question 4.2.2)**

This is a very new symbol intended to convey the hazards associated with chronic health effects.

Comprehension of the icon denoting chronic effects alone is poor, and incorrect answers were recorded in 60 to 70% of respondents across all sectors.

The majority of incorrect responses associated with icon with respiratory problems, which is consistent with the nature of the icon (fragmenting of a figure's chest. A number of other respondents interpreted it more literally – 'a hole in the back', 'indigestion', 'dangerous' or 'dangerous for the internal organs

when swallowed', 'damage inside.' Others associated the symbol with reproductive hazards or cancer. One respondent identified the symbol as denoting 'shooting' similar to the target icon.

Comprehensibility of the symbols denoting chronic reproductive and chronic carcinogenic effects was higher because of the presence of text attached to the symbol (see Tables 6.1.1 through 6.11.4).

*Chronic – Reproductive:* Where the symbol was accompanied by text to indicate reproductive hazards, incorrect answers included some references to the intended health hazard: 'Stop reproduction'; 'Can kill reproductive'. One respondent gave an interpretation that reflected a belief that the symbol indicated an effect that was positive for reproductive abilities. However, usually incorrect answers referred to general health hazards, such as: 'Damages the inner body'; 'Dangerous to your insides'; 'Dangerous for your body'; 'Harmful to your health'; 'Inside the body could be harmful'; or to specific health effects other than reproductive effects. These were usually respiratory, such as: 'Affects your lungs'; 'Lung damage'; 'Danger for the chest'; 'Affect the breathing system'; 'Must use breathing apparatus'; 'Burning chest'; 'Smelling chemicals will cause chest problems'; 'Do not inhale'; 'If it affects your lungs it can be harmful'; 'Can cause health products like heart or lung problems.'

In a small number of respondents, health problems unrelated to either reproductive or respiratory effects were identified: 'It can cause cancer'; 'Will get dizzy'; 'Burned person'; or identified routes of hazardous exposure: 'Must not inhale or drink the chemical'; 'If swallowed it can harm'; 'It spreads when enters the body.' Some respondents were simply unable to make a link to a health hazard and identified the icon as 'Man' or 'Human.'

*Chronic – Carcinogenic:* Where the symbol was accompanied by text to indicate carcinogenic hazards, incorrect answers did not include any reference to the intended health hazard. Usually, the incorrect responses indicated some hazard to the lungs (similarly to reproductive hazards): 'Affects your lungs'; 'Affects your chest'; 'Burning chest'; 'Respiratory problems - breathing or inhaling'; 'Lung damage'; 'Danger for the chest'; 'Smelling chemicals will cause chest problems'; 'Can cause health products like heart or lung problems'; or to general health problems: 'Harmful to your health'; 'Inside the body could be harmful'.

In a small number of respondents, health problems unrelated to either carcinogenic or respiratory effects were identified: 'It can burn the skin'; 'Can kill reproductive'; 'Sores on a person'; or identified routes of hazardous exposure: 'Do not inhale'; 'Must not inhale or drink the chemical'; 'Spreads when enters the body'; or indicated protective measures such as 'Wear mask'; 'Must use breathing apparatus.' As was the case with the reproductive hazard icon, some respondents were simply unable to make a link to a health hazard and identified the icon as 'Man' or 'Human'

Laboratory / health care providers were less likely to give incorrect answers for the carcinogenic symbol (21%) and more likely to give correct or partly correct answers (50%) than other categories of respondents (more than 39%, and less than 33%, respectively; Pearson  $\chi^2 = 21.5$ ;  $p = 0.043$ )

### **Oxidising Symbol (question 4.2.2)**

Incorrect answers generally exceeded correct or partly correct answers for all sectors.

Respondents most commonly confused this symbol with flammable. Partly correct answers were usually those that identified the symbol as flammable oxide or linked oxidising with flammable. Incorrect answers were common (> 50%) and included most commonly an interpretation as flammable, but also as: 'Fire on drum'; 'Fire hazard'; 'Fire-ball'; 'Cause a fire'; 'Flame'; 'a circus ring for lion to jump through'; 'Fire (O<sub>2</sub>) something to support fire'; 'Flammable - but means something more?' Some respondents associated the symbol with the sun: 'Sun giving off flames'; 'Beware of UV rays' while one respondent gave the symbol a spiritual interpretation: 'A new beginning of something' and another commented: 'Dangerous stationary object.' Respondents also commented that they were familiar with different colours surrounding the oxidising symbol, and this may add to confusion as to the meaning intended by the GHS usage of the symbol.

The fewest incorrect or critical confusions were reported by laboratory / health care personnel (36%) compared to other categories (production workers 53%, supervisors / managers 43% and safety representatives / shop stewards 46%; Pearson  $\chi^2 = 27.8$ ;  $p=0.006$ ).

### Compressed Gas Symbol (*question 4.2.2*)

This symbol attracted the highest proportion of 'don't know' responses, and was generally unfamiliar to most respondents outside the transport sector. Incorrect answers included references to: 'Condom'; 'Cigarette'; 'Dynamite'; 'Bullet'; 'Crayon'; 'Pencil'; 'Cell-phone'; 'Bottle' or 'Bottle that fell over'; 'Cider bat'; 'Cylinder can stand skew'; 'Container'; 'Bomb'; 'Koki pen'; 'Baby's bottle'; 'Tank'; 'Injection'; 'Spirit sign.' A few respondents identified it as indicating an action such as: 'In case of fire use extinguisher'; 'Do not use the can'; and 'Prohibit smoking.'

In general, percentages of critical confusions were highest amongst agricultural workers for most symbols. Critical confusions in excess of 5% were also evident for consumers for the symbols denoting compressed gas and corrosive to skin and metal.

### 6.6.2 Signal Words

Two GHS signal words were assessed– Danger and Warning (*question 3.6.1*). Respondents in the transport sector (92%) were slightly more likely to interpret the signal words correctly than in the industrial (76%), agricultural (75%) and consumer (78%) sectors although this was not statistically significant (Pearson  $\chi^2 = 14.3$ ;  $p = 0.11$ ). In general, comprehension of signal words was high across all sectors.

Interpretations of the signal word 'Danger' included: 'Do not disturb.' A number of respondents indicated the word would prompt them to take precautions before use (e.g. 'Not to do anything unless you read how to do it first'; 'Keep out - could cause death/sickness'). However, one respondent reported an interpretation that defeats the purpose of the label: 'You know that it is dangerous-you're not going to read the instructions.' 'Danger' was also associated with death for 3 respondents.

Interpretations for 'Warning' were similar, including prompting them to take precautions ('You're going to read the instructions') and associations with death.

Eighty-eight percent of respondents rated 'Danger' as worse than 'Warning' (*question 4.3.1*) and 85% indicated that the signal word would influence their future use of the chemical (*question 4.4.1*). There was no difference in relative ranking of 'Danger' in preference to 'Warning' by sector (Pearson  $\chi^2 = 3.24$ ;  $p = 0.357$ ) or in intended future use (Pearson  $\chi^2 = 3.88$ ;  $p = 0.275$ .)

The signal word 'Warning' was less likely to be reported as conveying a health consequence (Tables 6.12 through 6.12.4). This might explain the ranking of 'Danger' as more serious by respondents.

	Danger	Warning
Behaviour is prompted by meaning of the word	48%	62%
Health consequence conveyed by the word	23%	6%
General association with risk	27%	29%
Other	2%	3%

	Danger	Warning
Behaviour is prompted by meaning of the word	41%	60%
Health consequence conveyed by the word	21%	5%
General association with risk	32%	31%
Other	2%	4%

<b>Table 6.12.2. Associations with Signal Words that influence reported future use (question 4.4.1): Transport</b>		
	Danger	Warning
Behaviour is prompted by meaning of the word	57%	61%
Health consequence conveyed by the word	17%	4%
General association with risk	26%	34%
Other	0%	0%

<b>Table 6.12.3. Associations with Signal Words that influence reported future use (question 4.4.1): Agriculture</b>		
	Danger	Warning
Behaviour is prompted by meaning of the word	48%	60%
Health consequence conveyed by the word	28%	12%
General association with risk	20%	23%
Other	0%	5%

<b>Table 6.12.4. Associations with Signal Words that influence reported future use (question 4.4.1): Consumer</b>		
	Danger	Warning
Behaviour is prompted by meaning of the word	47%	67%
Health consequence conveyed by the word	28%	5%
General association with risk	24%	24%
Other	0%	3%

### 6.6.3 Hazard Statements

Forty-six percent of respondents indicated that there were words on the label, which they did not understand (*question 3.7.1*). The percentage was higher for agricultural respondents (66%) and consumers (60%) than other sectors (Pearson  $\chi^2 = 2855$ ;  $p > 0.001$ ). Those who spoke English at home were less likely (29%) to report the presence of words they didn't understand than those for whom English was not their home language (55%) (Pearson  $\chi^2 = 28.5$ ;  $p < 0.001$ ).

<b>Table 6.13. Total. Words in hazard statements which respondents reported not understanding (q3.7.1.1)</b>			
Adequate	19%	Inhalation	11%
Artificial respiration	10%	Immediately	5%
Barrier cream	10%	Irritation	5%
Contaminated	10%	Oxygen	4%
Conscious	8%	Precaution	3%
Copious	26%	Prolonged	6%
Fatal	5%	Quart	13%
Flammable	5%	Reproductive	6%
Fl Oz	13%	Treatment	5%
Induce	12%	Vapour	7%
Ingestion	9%	Ventilation	10%

Adequate	16%	Inhalation	9%
Artificial respiration	6%	Immediately	2%
Barrier cream	5%	Irritation	3%
Contaminated	7%	Oxygen	3%
Conscious	5%	Precaution	2%
Copious	24%	Prolonged	3%
Fatal	2%	Quart	7%
Flammable	2%	Reproductive	5%
Fl Oz	9%	Treatment	3%
Induce	10%	Vapour	5%
Ingestion	7%	Ventilation	7%

Adequate	6%	Inhalation	4%
Artificial respiration	-	Immediately	-
Barrier cream	1%	Irritation	3%
Contaminated	7%	Oxygen	-
Conscious	1%	Precaution	-
Copious	11%	Prolonged	4%
Fatal	-	Quart	1%
Flammable	1%	Reproductive	-
Fl Oz	3%	Treatment	1%
Induce	6%	Vapour	-
Ingestion	4%	Ventilation	4%

Adequate	39%	Inhalation	25%
Artificial respiration	28%	Immediately	16%
Barrier cream	27%	Irritation	15%
Contaminated	25%	Oxygen	15%
Conscious	22%	Precaution	15%
Copious	34%	Prolonged	19%
Fatal	21%	Quart	27%
Flammable	12%	Reproductive	19%
Fl Oz	30%	Treatment	15%
Induce	34%	Vapour	21%
Ingestion	22%	Ventilation	18%

Adequate	22%	Inhalation	10%
Artificial respiration	13%	Immediately	5%
Barrier cream	15%	Irritation	1%
Contaminated	8%	Oxygen	2%
Conscious	7%	Precaution	1%
Copious	37%	Prolonged	5%
Fatal	2%	Quart	23%
Flammable	7%	Reproductive	1%
Fl Oz	17%	Treatment	3%
Induce	7%	Vapour	6%
Ingestion	5%	Ventilation	12%

'Copious' (as in copious amounts of water) was the word most commonly identified as lacking understanding for all sectors, except for agriculture, where the terms 'adequate' and 'induce' gave higher reported percentage incomprehension.

Agricultural workers reported far more words than other sectors that they couldn't understand, with all 22 listed words being reported as incomprehensible to more than 10% of agricultural workers. In comparison, the number of words for which incomprehension exceeded 10% was 1 for industry, 1 for transport, and 7 for consumers.

Given later assessments of other hazard phrases (see Tables 6.14 through 6.14.4, and 6.15 through 6.15.4 below), these percentages are still likely to be serious underestimates.

Respondents were asked in a closed-ended option to indicate their understanding of two terms: "prolonged" (*question 3.7.3*) and "repeated" (*question 3.7.3.1*) as in "avoid prolonged or repeated breathing of vapour" (Tables 6.14 through 6.14.4).

Considerable variation is noted in how respondents understood these terms.

Slightly over a half thought 'prolonged' could be of the order of minutes, while over 40% held the view that 'prolonged' could any time period from hours or longer. Consumers were less likely to view prolonged as representing minutes (42%) than other sectors (61% or higher). This was statistically significant (Pearson  $\chi^2 = 28.45$ ;  $p = 0.019$ ).

The term 'repeated' was most commonly thought to be between twice and 5 times, but almost a quarter of respondents thought it could even be a once-off (i.e. ever) exposure. Consumers and industry respondents appeared to tolerate higher frequencies of repeat exposures considered dangerous – 28% were willing to consider up to 5 times as not hazardous but these differences were not significant (Pearson  $\chi^2 = 23.2$ ;  $p = 0.086$ ).

Terms such as 'prolonged' and 'repeated' may be highly subjective and require careful training. Evidence emerging from this study supports this supposition.

How long is prolonged? ( <i>q3.7.3</i> )		How many times is repeated? ( <i>q3.7.3.1</i> )	
Minutes	59%	Once	22%
Hours	23%	2-5 times	54%
Days	12%	6-10 times	10%
Weeks	2%	11-20 times	3%
Months	4%	20-50 times	2%
Longer	<1%	Indefinite	9%

How long is prolonged? ( <i>q3.7.3</i> )		How many times is repeated? ( <i>q3.7.3.1</i> )	
Minutes	61%	Once	23%
Hours	21%	2-5 times	49%
Days	12%	6-10 times	12%
Weeks	3%	11-20 times	3%
Months	4%	20-50 times	2%
Longer	0%	Indefinite	11%

How long is prolonged? (q3.7.3)		How many times is repeated? (q3.7.3.1)	
Minutes	64%	Once	22%
Hours	22%	2-5 times	57%
Days	10%	6-10 times	3%
Weeks	0%	11-20 times	3%
Months	4%	20-50 times	1%
Longer	0%	Indefinite	14%

How long is prolonged? (q3.7.3)		How many times is repeated? (q3.7.3.1)	
Minutes	68%	Once	32%
Hours	15%	2-5 times	55%
Days	7%	6-10 times	3%
Weeks	2%	11-20 times	3%
Months	8%	20-50 times	0%
Longer	0%	Indefinite	7%

Five hazard statements (*question 3.7.3.2*) were selected for open-ended assessment of comprehension to self (columns 2 to 6), and perceived comprehensibility to others (column 7 in Table 6.15). Overall understanding (correct and partly correct) varied from 61% to 85%. The phrase with the lowest overall understanding ('do not induce vomiting') had the highest percentage of 'don't know' and critical confusions, (probably because of its negative command) and was cited with the lowest likelihood of being comprehensible to other workers.

Critical confusions for 'do not induce vomiting' include: 'Give salt water. Sticking finger down throat'; 'Encourage vomiting when swallowed'; 'It must come out (vomit)'; 'You must try and vomit'; 'Vomit in case of swallowing', etc. Farm workers were particularly stymied by this phrase with a very high percentage of 'Don't know' (48%). However, the highest rate of critical confusions for this phrase existed amongst consumers (17%). Non-English (home language) had rates of critical confusions (11%) and "don't knows" (29%) that were much higher than respondents whose home language was English (6% and 6%, respectively) (Pearson  $\chi^2 = 68.8$ ;  $p = 0.001$ ).

Farm workers had the highest rates (22%) of 'Don't know' for the phrase 'In case of eye contact, immediately flush eyes or skin with copious amounts of water.'

Critical confusions were reported by 11 respondents (from all sectors) including comments such as "Before using wash eyes and skin"; 'If my face has come in contact with chemical I must close my eyes and immediately wash my face'; 'Do not waste water.'

Although the phrases "work in conditions of adequate ventilation" and "If not breathing, give artificial respiration" had low frequencies of critical confusions, there were still some key misunderstandings. For example, one respondent interpreted adequate ventilation as being "as long as [you are] not getting dizzy while working", while another commented "[there is] nothing you can do if you're getting paid for the job."

Farm workers reported the highest percentage of "don't knows", and the lowest percentages for perceived comprehensibility to others for all hazard statements.

	Comprehension					
	Correct	Partly correct	Incorrect	Critical confusion	Doesn't know	Compre - hensible to others
Work in conditions of adequate ventilation	69%	10%	7%	1%	13%	68%
Do not induce vomiting	54%	7%	9%	9%	22%	54%
In case of eye contact, immediately flush eyes or skin with copious amounts of water	47%	38%	4%	3%	9%	74%
If not breathing, give artificial respiration	55%	22%	10%	1%	14%	70%
If breathing is difficult, give oxygen	56%	20%	12%	0.3%	12%	72%

	Comprehension					
	Correct	Partly correct	Incorrect	Critical confusion	Doesn't know	Compre - hensible to others
Work in conditions of adequate ventilation	73%	13%	5%	1%	8%	73%
Do not induce vomiting	56%	11%	9%	5%	19%	54%
In case of eye contact, immediately flush eyes or skin with copious amounts of water	47%	42%	5%	2%	3%	74%
If not breathing, give artificial respiration	56%	27%	7%	1%	9%	72%
If breathing is difficult, give oxygen	57%	28%	9%	-	7%	75%

	Comprehension					
	Correct	Partly correct	Incorrect	Critical confusion	Doesn't know	Compre - hensible to others
Work in conditions of adequate ventilation	71%	7%	13%	-	10%	72%
Do not induce vomiting	56%	3%	10%	15%	17%	60%
In case of eye contact, immediately flush eyes or skin with copious amounts of water	44%	44%	3%	1%	7%	78%
If not breathing, give artificial respiration	50%	24%	18%	1%	7%	82%
If breathing is difficult, give oxygen	64%	11%	19%	1%	4%	81%

	Comprehension					
	Correct	Partly correct	Incorrect	Critical confusion	Doesn't know	Comprehensible to others
Work in conditions of adequate ventilation	52%	9%	6%	-	33%	49%
Do not induce vomiting	24%	6%	12%	6%	52%	28%
In case of eye contact, immediately flush eyes or skin with copious amounts of water	33%	33%	6%	5%	23%	61%
If not breathing, give artificial respiration	35%	21%	9%	-	35%	50%
If breathing is difficult, give oxygen	47%	17%	6%	-	30%	56%

	Comprehension					
	Correct	Partly correct	Incorrect	Critical confusion	Doesn't know	Comprehensible to others
Work in conditions of adequate ventilation	74%	6%	8%	1%	12%	69%
Do not induce vomiting	70%	1%	5%	14%	10%	68%
In case of eye contact, immediately flush eyes or skin with copious amounts of water	58%	25%	2%	5%	10%	80%
If not breathing, give artificial respiration	70%	10%	7%	-	13%	71%
If breathing is difficult, give oxygen	53%	13%	18%	-	16%	72%

Critical confusions were not exclusively present amongst non-English speakers but were more common amongst those speaking a different language at home. The farm worker group pointed out that the phrase 'Reproductive effects' gave the exact opposite impression to the group, that it was in some way associated with fertility.

#### **6.6.4 Colour (questions 4.1.1 and 4.1.2)**

Red was the colour most commonly (95%) reported as denoting the highest level of danger, followed by yellow (2%). Notably, the one industry group discussion (chemical company) concurred with this motivating this choice by referring to the red used in electrical appliances to indicate live current (+ve lead). Yellow was usually ranked second (58%). Green and blue were usually ranked third or fourth. There were no differences across sectors for colour preference.

Choice of a colour ranking (*question 4.2.1*) was usually due an explicit association of colour with a hazard level (82%), irrespective of sector. Other reasons given included as association of colour with traffic signs (2%), or with unrelated factors (4%). Nine percent of respondents indicated they would still read the label before allowing colour to influence their ranking. This was confirmed in the farm workers

group discussion, where respondents indicated that they would still want to read the label before proceeding, since they believed that all chemicals (pesticides) are potentially hazardous.

Colour blindness was associated with ranking preferences. Of the 47 respondents screened to have one or other form of colour blindness, yellow was consistently rated higher than for those who were not colour blind (Pearson  $\chi^2 = 9.2$ ;  $p = 0.163$ ).

The frequency of different colour coding sequences is listed in Tables 6.16 through 6.16.4. There was an association between colour blindness and the preference for colour sequences (Pearson  $\chi^2 = 16.8$ ;  $p = 0.03$ ). However, the exact preference was not consistent across sectors. The sequence red-green-yellow-blue was more common than other sequences for industry and agriculture, while red-green-blue-yellow was more common in transport and red-green-yellow-blue was more common in consumers. Only the consumer distribution was statistically significant (Pearson  $\chi^2 = 15.77$ ;  $p=0.008$ ). What is consistent across sectors is that colour blindness is less common in those identifying the modal sequence: red-yellow-green-blue.

Ranking high to low	Prevalence	n	% of those choosing this patterns of sequence who are colour blind
Red-yellow-green-blue	32%	121	6%
Red-yellow-blue-green	27%	100	8%
Red-green-yellow-blue	14%	53	25%
Red-blue-yellow-green	10%	38	16%
Red-blue-green-yellow	7%	31	13%
Red-green-blue-yellow	7%	28	7%
Other permutations	2%	6	17%

Ranking high to low	Prevalence	n	% of those choosing this patterns of sequence who are colour blind
Red-yellow-green-blue	31%	52	4%
Red-yellow-blue-green	28%	46	11%
Red-green-yellow-blue	16%	26	19%
Red-green-blue-yellow	9%	15	0%
Red-blue-green-yellow	8%	13	15%
Red-blue-yellow-green	7%	12	17%
Other permutations	2%	3	33%

Ranking high to low	Prevalence	N	% of those choosing this patterns of sequence who are colour blind
Red-yellow-green-blue	39%	26	0%
Red-yellow-blue-green	33%	22	9%
Red-green-yellow-blue	9%	6	0%
Red-blue-yellow-green	9%	6	17%
Red-green-blue-yellow	5%	3	33%
Red-blue-green-yellow	3%	2	50%
Other permutations	3%	2	0%

Ranking high to low	Prevalence	N	% of those choosing this patterns of sequence who are colour blind
Red-yellow-blue-green	30%	18	5%
Red-yellow-green-blue	20%	12	25%
Red-green-yellow-blue	18%	11	27%
Red-blue-yellow-green	18%	11	9%
Red-blue-green-yellow	8%	5	0%
Red-green-blue-yellow	5%	3	0%
Other permutations	2%	1	0%

Ranking high to low	Prevalence	N	% of those choosing this patterns of sequence who are colour blind
Red-yellow-green-blue	38%	31	7%
Red-yellow-blue-green	17%	14	0%
Red-blue-green-yellow	13%	11	9%
Red-green-yellow-blue	12%	10	50%
Red-blue-yellow-green	11%	9	22%
Red-green-blue-yellow	9%	7	14%
Other permutations	0%	0	13%

Colour is an important component of pesticide hazard communication, with agricultural labels in South Africa graded by colour to reflect toxicity. Red typically indicates the most hazardous, followed by yellow, blue and, lastly, green. There was no evidence that this pattern was more commonly followed by agricultural workers compared to other sectors. Only 30% of agricultural workers reported this sequence.

### 6.6.5 Pictograms

Comprehension of pictograms (*question 7.2.1*) relating to protective clothing use and hygiene (wearing gloves, boots, respirator, and face mask, and washing hands after use) was generally better than comprehension for hazard symbols (Tables 6.11 through 6.11.4 above). Correct and partly correct responses for these kinds of pictograms generally exceeded 90%, across all sectors. For the symbol for a face mask, production workers (9%) and laboratory / health care workers (12%) were more likely to get it wrong than other categories (0%) (Pearson's  $\chi^2 = 23.9$ ;  $P=0.021$ ).

However comprehension of pictograms denoting potential harm to the environment, and those relating to pesticide handling activities (which were only asked of agricultural and consumer sectors) indicated much lower comprehension, and also a significant number of critical confusions.

Pictograms for harmful to fish and water bodies, livestock and to wild animals, and pictograms denoting pesticide use instructions generally yielded higher percentages of don't know or incorrect answers than partly correct or correct answers in both consumers and agricultural workers.

The symbol that denoted **danger to fish & water bodies**, drew responses such as: 'Be aware of fish'; 'No fish around here'; 'No swimming fish in the water'; 'Contaminated water.' The symbol that denoted **hazard to livestock & poultry** drew responses such as: 'Meat you eat affected by chemical'; 'No cows and chickens allowed'; 'No animals allowed'; 'Home animals'; 'Don't feed to animals'; 'Mustn't work near animals'. The symbol that denoted **wildlife & birds** drew responses such as: 'Wild animals are not allowed'; 'Meat you eat affected by chemical'; 'Beware of the buck and birds'; 'You find

springbok and birds around'; 'Be careful of wild animals'; Keep away from animals'; Don't run over wildlife.'

The pictogram indicating the need to **keep the chemical locked away from the reach of children** was understood by 78% of consumer and agricultural respondents. However, agricultural respondents' answers included a significant number (6%) of critical confusions for this safety icon. The symbol drew responses such as: 'Gas bottle locked away'; 'Shows where fire hydrant is'; 'Liquid must be locked away'; 'Don't drink or touch any chemical'; 'Electric.'

	Comprehension				
	Correct	Partly correct	Incorrect	Critical confusion	Don't know
Wear protective gloves	84%	14%	2%	0.3%	0.3%
Wear protective boots	85%	11%	3%	0.3%	1%
Wear respirator	44%	50%	5%	-	1%
Wear face mask	27%	66%	6%	-	2%
Wash hands after use	33%	64%	3%	-	1%
Harmful to fish and water bodies*	29%	17%	34%	3%	17%
Harmful to livestock*	26%	20%	40%	3%	12%
Harmful to wild animals*	23%	19%	34%	4%	20%
Do not apply by aerial spray*	33%	12%	27%	3%	24%
Keep under lock away from children*	25%	50%	12%	3%	11%
Instructions for mixing powder (activity icon)*	3%	16%	36%	3%	42%
Instructions for mixing liquid (activity icon)*	3%	16%	39%	2%	41%
Instructions for application (activity icon)*	5%	36%	39%	-	20%
Expiry date*	26%	7%	53%	1%	13%

\* Symbols only asked of agricultural, consumer sectors (n=143) that may have contact with pesticides

	Comprehension				
	Correct	Partly correct	Incorrect	Critical confusion	Don't know
Wear protective gloves	74%	24%	1%	1%	-
Wear protective boots	82%	14%	2%	1%	1%
Wear respirator	52%	44%	4%	-	-
Wear face mask	31%	66%	4%	-	1%
Wash hands after use	35%	63%	1%	-	1%

<b>Table 6.17.2. Comprehension of pictograms (q7.2.1): Transport</b>					
	Comprehension				
	Correct	Partly correct	Incorrect	Critical confusion	Don't know
Wear protective gloves	92%	3%	4%	-	1%
Wear protective boots	92%	6%	3%	-	-
Wear respirator	64%	33%	3%	-	-
Wear face mask	26%	67%	6%	-	1%
Wash hands after use	28%	68%	4%	-	-

<b>Table 6.17.3. Comprehension of pictograms (q7.2.1): Agriculture</b>					
	Comprehension				
	Correct	Partly correct	Incorrect	Critical confusion	Don't know
Wear protective gloves	87%	12%	2%	-	-
Wear protective boots	84%	11%	5%	-	2%
Wear respirator	34%	57%	8%	-	2%
Wear face mask	28%	58%	9%	-	5%
Wash hands after use	30%	63%	5%	-	3%
Harmful to fish and water bodies	39%	13%	31%	3%	13%
Harmful to livestock	31%	24%	34%	3%	8%
Harmful to wild animals	30%	24%	30%	6%	11%
Do not apply by aerial spray	31%	16%	33%	6%	13%
Keep under lock away from children	19%	54%	12%	6%	9%
Instructions for mixing powder (activity icon)	5%	21%	39%	5%	31%
Instructions for mixing liquid (activity icon)	5%	19%	42%	3%	31%
Instructions for application (activity icon)	6%	43%	37%	-	13%
Expiry date	13%	5%	54%	3%	25%

<b>Table 6.17.4. Comprehension of pictograms (q7.2.1): Consumers</b>					
	Comprehension				
	Correct	Partly correct	Incorrect	Critical confusion	Don't know
Wear protective gloves	95%	4%	1%	-	-
Wear protective boots	87%	10%	2%	-	-
Wear respirator	21%	71%	6%	-	2%
Wear face mask	21%	70%	8%	-	1%
Wash hands after use	35%	63%	2%	-	-
Harmful to fish and water bodies	21%	20%	38%	1%	21%
Harmful to livestock	21%	17%	45%	1%	16%
Harmful to wild animals	17%	14%	39%	1%	29%
Do not apply by aerial spray	35%	9%	23%	-	33%
Keep under lock away from children	30%	48%	12%	-	10%
Instructions for mixing powder (activity icon)	2%	12%	35%	1%	51%
Instructions for mixing liquid (activity icon)	1%	13%	37%	1%	48%
Instructions for application (activity icon)	5%	30%	41%	-	24%
Expiry date	36%	9%	52%	-	4%

The symbol that denoted **not for aerial application** drew responses such as: 'Dangerous area for aeroplanes'; 'Aerial spray'; 'Aeroplane should not spray water'; 'Beware of planes'; 'Aeroplane in the airport'; 'Can't use water with chemical to stop fire'; 'Shower'; 'Be alert for chemicals from planes.'

The symbol that denoted **handling liquid concentrate** drew responses such as: 'Pour glass'; 'Can splatter, this is a liquid'; 'Gases/Liquid/Poison'; 'Pour into cup - use gloves'; 'Don't pour chemicals without gloves'; 'Throw in a little cup'; 'Mustn't drink it'; 'Small doses'; 'Don't pour into bowls'; 'Only use a capful.'

The symbol that denoted **handling dry concentrate** drew responses such as: 'Can't splatter, this is a powder'; 'Use measurement - powder'; 'Chemical measure'; 'Pour in water'; 'Mustn't drink it'; 'Protect yourself by using big doses'; 'Don't pour into bowls'; 'Use whole contents.'

The symbol that denoted **application** drew responses such as: 'Busy preventing insects - spraying'; 'You can't spray in garden on plants'; 'Flame-thrower'; 'Suitable for weed killing.'

Consumers appeared to recognise the expiry date symbol correctly more often (36%) than agricultural workers (13%), which may reflect the use of this icon in other consumer activities and branding. The symbol that denoted **Expiry date** was poorly understood and drew responses relating to a literal interpretation of time or other incorrect explanations such as manufacture date or: 'Don't work too long because it's dangerous'; 'Amount of time you can use (work with) the product'; 'Timer - time yourself.'

## 6.7 Comprehension of Safety Data Sheets

Respondents in industry, transport and agriculture were asked specific prompted questions which required attention to the SDS. Responses are listed in the Table 6.18 through 6.18.3 below.

Respondents were clearly able to identify important hazards (flammability; *question 8.4.1*) and obviously intuitive proscriptions (e.g. storing in an open drum (*question 8.4.5*), throwing down the drain (*question 8.4.7*)). This pattern is consistent across all sectors.

For the question (8.4.4) on whether one must store the chemical in the dark, over 50% of industry and transport respondents, and close to 50% of agricultural respondents answered yes, which is an incorrect answer. For the question on the mandatory use of a respirator (*question 8.4.6*), about 50% believed the chemical required use of a respirator. The SDS does not indicate that the chemical can only be used if a respirator is worn (usually a respirator will be indicated when environmental concentrations are likely to exceed standards).

Both questions may be regarded as markers for over-reporting since storage in the dark was not indicated by the SDS and use of a respirator is not mandatory. Therefore, the data may suggest some evidence of over-reporting, or that Industry and transport workers may be more careful with regards to safety precautions with chemicals than agricultural workers.

A high proportion of respondents (61% overall, 75% industry, 60% transport and 51% agriculture) could identify mutagenicity in the chemical concerned (*question 8.4.2*). However, many respondents required an explanation of the term before being able to answer, as a result of which, these percentages are probably over-estimates of true comprehensibility.

Less than 60% of subjects appeared to use the SDS adequately when answering the question 8.4. Respondents may therefore have been relying on knowledge from preceding questions from earlier modules to answer. Moreover, production workers were less likely (52%) to look at the SDS when responding to questions on items covered in the SDS than others (68%, 62%, 68%, respectively; Pearson's  $\chi^2 = 8.6$ ;  $p = 0.035$ ).

Most respondents, across all sectors, indicated that they knew not to throw the chemical down the drain. However, this report is of intended behaviour and may not reflect actual behaviour in real-life situations.

Question	Correct response	% correct	% Didn't know
Do you think this chemical is flammable? (q8.4.1)	Yes	93%	3%
Do you think this chemical is mutagenic? * (q8.4.2)	Yes	62%	23%
Do you think you must always prevent this chemical from being mixed with water? (q8.4.3)	No	29%	9%
Do you think this chemical must be stored in the dark? (q8.4.4)	No	36%	9%
Do you think this chemical can be stored in an open drum? (q8.4.5)	No	87%	4%
Do you think this chemical can only be used if the worker wears a respirator? (q8.4.6)	No	46%	1%
Can you throw this chemical down the drain? (q8.4.7)	No	79%	5%

\* A number of respondents required an explanation of this term, hence this percentage is probably an over-estimate of true perceptions.

Question	Correct response	% correct	% Didn't know
Do you think this chemical is flammable? (q8.4.1)	Yes	95%	2%
Do you think this chemical is mutagenic? * (q8.4.2)	Yes	60%	20%
Do you think you must always prevent this chemical from being mixed with water? (q8.4.3)	No	31%	9%
Do you think this chemical must be stored in the dark? (q8.4.4)	No	38%	8%
Do you think this chemical can be stored in an open drum? (q8.4.5)	No	90%	4%
Do you think this chemical can only be used if the worker wears a respirator? (q8.4.6)	No	45%	1%
Can you throw this chemical down the drain? (q8.4.7)	No	79%	5%

\* A number of respondents required an explanation of this term, hence this percentage is probably an over-estimate of true perceptions.

Question	Correct response	% correct	% Didn't know
Do you think this chemical is flammable? (q8.4.1)	Yes	96%	1%
Do you think this chemical is mutagenic? * (q8.4.2)	Yes	76%	13%
Do you think you must always prevent this chemical from being mixed with water? (q8.4.3)	No	28%	6%
Do you think this chemical must be stored in the dark? (q8.4.4)	No	25%	%
Do you think this chemical can be stored in an open drum? (q8.4.5)	No	83%	1%
Do you think this chemical can only be used if the worker wears a respirator? (q8.4.6)	No	44%	-
Can you throw this chemical down the drain? (q8.4.7)	No	78%	1%

\* A number of respondents required an explanation of this term, hence this percentage is probably an over-estimate of true perceptions.

Question	Correct response	% correct	% Didn't know
Do you think this chemical is flammable? (q8.4.1)	Yes	83%	9%
Do you think this chemical is mutagenic? * (q8.4.2)	Yes	51%	42%
Do you think you must always prevent this chemical from being mixed with water? (q8.4.3)	No	25%	14%
Do you think this chemical must be stored in the dark? (q8.4.4)	No	42%	12%
Do you think this chemical can be stored in an open drum? (q8.4.5)	No	81%	9%
Do you think this chemical can only be used if the worker wears a respirator? (q8.4.6)	No	51%	2%
Can you throw this chemical down the drain? (q8.4.7)	No	80%	10%

\* A number of respondents required an explanation of this term, hence this percentage is probably an over-estimate of true perceptions.

Respondents were asked (question 8.4.8) what they would do in the event of a fire with the chemical (acetone). The majority (80%) of respondents gave answers that were appropriate to the question including the use of a fire extinguisher (43%), foam (7%) or other means to contain or end the fire. However, 7% of responses (industry 8%, transport 7% and agriculture 5%) indicated the use of water, which is explicitly identified as inadequate for the control of an acetone fire on the SDS. Nine respondents indicated they would run away, while six gave answers that were critical confusions. No differences in patterns were evident across sectors.

Another question asked respondents what precautions they would take if they were working with the chemical (question 8.4.9). Responses were almost all (95%) correct, with the balance not knowing what to do. However, by far the commonest response was to use PPE (88% of responders), and very few respondents indicated any of the other control measures listed on the SDS such as better ventilation, avoiding sparking, storage in a cool area, etc. This pattern was similar across sectors.

Although best practice in occupational hygiene requires a hierarchy of controls, in which PPE is not the first line of safety, this approach did not emerge from respondent answers to this question, and important information contained in the SDS about controls other than PPE were not identified.

	Comprehension				
	Correct	Partly correct	Incorrect	Critical confusion	Doesn't know
Acute hazard	5%	18%	12%	1%	64%
First Aid	49%	29%	6%	-	16%
Dispersion	10%	8%	18%	3%	62%
Combustion	17%	13%	12%	1%	58%
Neurological	22%	4%	7%	-	67%
Volatile	11%	7%	10%	-	72%

<b>Table 6.19.1. Comprehension of SDS information (q 8.4.10): Industry</b>					
	Comprehension				
	Correct	Partly correct	Incorrect	Critical confusion	Doesn't know
Acute hazard	6%	21%	12%	1%	60%
First Aid	49%	36%	6%	-	10%
Dispersion	11%	10%	21%	4%	54%
Combustion	19%	14%	14%	1%	52%
Neurological	28%	5%	9%	-	58%
Volatile	15%	9%	12%	-	65%

<b>Table 6.19.2. Comprehension of SDS information (q 8.4.10): Transport</b>					
	Comprehension				
	Correct	Partly correct	Incorrect	Critical confusion	Doesn't know
Acute hazard	4%	18%	11%	-	67%
First Aid	56%	22%	6%	-	17%
Dispersion	8%	6%	17%	1%	68%
Combustion	17%	15%	14%	-	54%
Neurological	14%	3%	6%	-	78%
Volatile	7%	7%	10%	-	76%

<b>Table 6.19.3. Comprehension of SDS information (q 8.4.10): Agriculture</b>					
	Comprehension				
	Correct	Partly correct	Incorrect	Critical confusion	Doesn't know
Acute hazard	2%	12%	10%	3%	73%
First Aid	40%	18%	8%	-	33%
Dispersion	8%	3%	10%	-	78%
Combustion	10%	5%	3%	-	82%
Neurological	12%	2%	5%	-	82%
Volatile	7%	-	5%	-	88%

Phrases on the SDS (*question 8.4.10*) were poorly understood (except for first aid). The majority of respondents indicated they did not know what the phrases meant, across all sectors. This is consistent with the parallel questions on the label above (Tables 6.13 through 6.15). Production workers generally reported the poorest comprehension out of all job categories for most hazard terms. For example, production workers more likely to report not knowing what the term 'first aid' meant (24%) and less likely to give correct or partly correct answers (71%) than other categories of employee (10% or less did not know, and 82% or more gave correct or partly correct answers; Pearson's  $\chi^2 = 20.0$ ;  $p < 0.001$ ). Similar discrepancies (production workers with lowest comprehension) were evident for terms 'dispersion', 'combustion', 'neurological' and 'volatile.' The category of laboratory/health care workers were most likely to understand the terms 'neurological' (Pearson's  $\chi^2 = 32.2$ ;  $p < 0.001$ ) and 'volatile' (Pearson's  $\chi^2 = 24.1$ ;  $p = 0.004$ ) than other categories of employee. Comprehension amongst safety representatives / shop stewards of hazard terms was generally low (less than 35% correct or partly correct), except for the term 'first aid' (82% correct and partly correct).

## 6.8 Usefulness of Hazard Communication Data

Almost all respondents (>98%) indicated that they would use a label on a container (*question 10.5.1*) if, in future, they needed to find information about a chemical<sup>8</sup>. This was the case, irrespective of the sector of the respondent. The equivalent figure for the use of SDS's (*question 8.5.1*) amongst workers was 87% (consumers were not asked this question). There was a slightly lower rate of anticipated use of SDSs reported amongst agricultural workers (80%) than amongst industry (93%) or transport (94%) workers (Pearsons  $\chi^2 = 10.64$ ;  $p = 0.03$ ).

The reasons given for why labels (*question 3.8.4*) and SDS's (*question 3.9.5*) were used in the past, and why SDS (*questions 8.5.1.1 and 8.5.1.2*) and labels (*questions 10.5.1*) would be used in future are given in Tables 6.20 through 6.20.4 below. Note that consumers did not deal with SDSs.

The most common reason given for past use of a label was usually to obtain instruction for use (41% for both industry and agricultural respondents, 26% for transporters and 53% for consumers). Other common reasons were for product information (14% of industry respondents and 10% of transport respondents), composition (10% of industry respondents), hazard identification (15% of industry respondents, 24% of transport respondents) and safety precautions (10% of industry respondents and 20% of industry respondents). Amongst both consumers and agricultural respondents, for practical purposes, the only other reason cited was for safety precautions (PPE) only (22% and 18%, respectively). "Other reasons" cited in the tables usually referred to a respondent citing use of a domestic product without giving the exact reason for use of the label. A smaller number of respondents cited information needed for future use of labels and SDS's as including information specific to transport needs such as UN numbers (7 for labels and 11 for SDSs).

SDSs were reported more commonly as sources of information on hazard identification and product information than were labels across all employee sectors.<sup>9</sup> Transport workers commonly reported SDSs as past sources for product information (61%), more so than industry workers (29%). SDSs were not reported at all (0%) as past sources of information for first aid.

When comparing information that respondents reported seeking the last time they used a label (*question 3.9.4*) to the information they indicated (after a long interview on hazard communication) they would seek from a label the next time (*question 10.5.1*), the proportion of certain types of information as the reason for label use increased:

- Hazard identification: 15% to 28% industry; 24% to 31% transport; 5% to 31% agriculture; 8% to 28% consumers.
- Safety precautions: 10% to 20% industry; 20% to 19% transport; 22% to 28% agriculture; 18% to 48% consumers

What declined for all sectors was the use of a label for information on instructions for use (41% to 11% for industry, 26% to 8% for transport, 41% to 14% for agriculture and 53% to 7% for consumers). The apparent decline in hazard identification may be an artefact of greater classification and coding opportunities for future use.

When comparing information that respondents reported seeking the last time they used a SDS (*question 3.9.5*) to the information they indicated (after a long interview on hazard communication) they would seek from an SDS the next time (*question 8.5.1.1*), it appears that future use of SDSs had higher frequencies for first aid measures (from 0% to 34% for industry, and from 0% to 30% for transport), safety precautions (from 7% to 19% for industry, and from 11% to 25% for transport). The

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<sup>8</sup> This question appeared at the end of the modules and the respondent could well be said to have been 'primed' by the interview process. On the other hand, the interview process might genuinely have prompted a serious consideration on the part of the respondent.

<sup>9</sup> Note that (a) the coding truncated classification of more than 9 options for reasons for last use of a SDS so that information may have been lost, or specific reasons misclassified as hazard identification; (b) very few agricultural respondents (n=5) reported using an SDS so that the percentages for agricultural respondents are highly unstable.

apparent decline in hazard identification may be an artefact of greater classification and coding opportunities for future use.

In reporting future use, SDSs were not commonly cited as sources for obtaining instructions for use except in agriculture (32%). There were no differences in stated intention for use between different job categories.

	SDS		Label	
	Last time* (n=98)	In future* (n=101)	Last time* (n=288)	In future (n=388)
Product Information	36%	2%	10%	10%
Composition and information on ingredients	12%	9%	6%	1%
Hazard identification	44%	16%	12%	28%
First aid measures	-	32%	0.4%	1%
Fire-fighting instructions	7%	7%	-	-
Accidental release measures	2%	4%	-	-
Handling and storage	6%	20%	-	0.5%
Safety precautions, exposure controls and PPE	7%	19%	15%	27%
Physical and chemical properties	2%	7%	2%	0.3%
Stability and reactivity	NR	1%	1%	-
Toxicological information	NR	1%	3%	-
Ecotoxicological information	NR	-	1%	0.3%
Disposal	NR	1%	2%	0.5%
Regulatory information	NR	-	3%	-
Instructions for use	NR	13%	41%	10%
Emergency instructions and spillage	NR	10%	2%	1%
All of the above	NR	4%	1%	7%
Other reasons	NR	20%	16%	12%

\* Respondents could give more than one answer to these questions; hence totals may exceed 100%.  
NR = Not recorded

	SDS		Labels	
	Last time* (n=75)	In future* (n=62)	Last time* (n=135)	In future* (n=166)
Product Information	29%	3%	14%	13%
Composition and information on ingredients	12%	1%	10%	2%
Hazard identification	49%	21%	15%	28%
First aid measures	-	34%	1%	1%
Fire-fighting instructions	7%	6%	-	-
Accidental release measures	-	3%	-	-
Handling and storage	5%	21%	-	-
Safety precautions, exposure controls and PPE	7%	19%	10%	20%
Physical and chemical properties	7%	10%	1%	1%
Stability and reactivity	NR	-	1%	-
Toxicological information	NR	-	4%	-
Ecotoxicological information	NR	-	-	1%
Disposal	NR	2%	1%	1%
Regulatory information	NR	-	5%	-
Instructions for use	NR	10%	41%	11%
Emergency instructions and spillage	NR	6%	2%	1%
All of the above	NR	5%	1%	5%
Other reasons	NR	19%	10%	14%

\* Respondents could give more than one answer to these questions; hence totals may exceed 100%.  
NR = Not recorded

	SDS		Labels	
	Last time* (n=18)	In future* (n=20)	Last time* (n=50)	In future* (n=72)
Product Information	61%	-	10%	18%
Composition and information on ingredients	17%	-	2%	-
Hazard identification	44%	5%	24%	31%
First aid measures	-	30%	-	-
Fire-fighting instructions	11%	15%	-	-
Accidental release measures	11%	5%	-	-
Handling and storage	6%	10%	-	-
Safety precautions, exposure controls and PPE	11%	25%	20%	19%
Physical and chemical properties	-	-	6%	-
Stability and reactivity	NR	5%	2%	-
Toxicological information	NR	-	4%	-
Ecotoxicological information	NR	-	2%	-
Disposal	NR	-	8%	-
Regulatory information	NR	-	2%	-
Instructions for use	NR	5%	26%	8%
Emergency instructions and spillage	NR	25%	6%	-

All of the above	NR	-	2%	10%
Other reasons	NR	25%	12%	10%

\* Respondents could give more than one answer to these questions; hence totals may exceed 100%.  
NR = Not recorded

<b>Table 6.20.3. What information did/would the respondent use the label and SDS for: Agriculture</b>				
	SDS		Label	
	Last time* (n=5)	In future* (n=19)	Last time* (n=41)	In future* (n=64)
Product Information	40%	-	7%	5%
Composition and information on ingredients	-	11%	-	-
Hazard identification	40%	11%	5%	31%
First aid measures	-	26%	-	-
Fire-fighting instructions	-	-	-	-
Accidental release measures	-	5%	-	-
Handling and storage	20%	26%	-	2%
Safety precautions, exposure controls and PPE	-	11%	22%	28%
Physical and chemical properties	-	5%	2%	-
Stability and reactivity	NR	-	-	-
Toxicological information	NR	5%	2%	-
Ecotoxicological information	NR	-	5%	-
Disposal	NR	-	2%	-
Regulatory information	NR	-	2%	-
Instructions for use	NR	32%	41%	14%
Emergency instructions and spillage	NR	5%	2%	-
All of the above	NR	5%	-	9%
Other reasons	NR	16%	20%	16%

\* Respondents could give more than one answer to these questions; hence totals may exceed 100%.  
NR = Not recorded

<b>Table 6.20.4. What information did the respondent use the label for: Consumer<sup>b</sup></b>		
	Last time* (n=62)	In future* (n=86)
Product Information	2%	2%
Composition and information on ingredients	3%	-
Hazard identification	8%	28%
First aid measures	-	1%
Fire-fighting instructions	-	-
Accidental release measures	-	-
Handling and storage	-	-
Safety precautions, exposure controls and PPE	18%	48%
Physical and chemical properties	-	-
Stability and reactivity	-	-
Toxicological information	-	-
Ecotoxicological information	-	-
Disposal	-	-
Regulatory information	-	-
Instructions for use	53%	7%
Emergency instructions and spillage	-	1%

All of the above	-	7%
Other reasons	31%	6%

\* Respondents could give more than one answer to this question; hence totals may exceed 100%.

NR = Not recorded

§ SDSs not relevant for consumers

The reason given (*question 8.5.1.2*) why such information would be sought from an SDS was usually to protect self and co-workers (73%; industry 76%, transport 73% and agriculture 67%), identification of the hazards (4%, industry 4%, transport 6% and agriculture 6%), product identification (4%, industry 3%, transport 8%, agriculture 0%), safety instructions (4%, industry 2%, transport 5% and agriculture 6%) or instructions for use (2%, industry 3%, transport 0%, agriculture 4%).

<b>Table 6.21. Total. Respondent view: Ease of understanding an SDS</b>			
	1 = Not easy at all	2 = Moderate	3 = Very easy
For self (n=290) ( <i>q 8.5.2</i> )	18%	38%	45%
For others (n=288) ( <i>q 8.5.3</i> )	29%	44%	27%

<b>Table 6.21.1. Respondent view: Ease of understanding an SDS: Industry</b>			
	1 = Not easy at all	2 = Moderate	3 = Very easy
For self (n=290) ( <i>q 8.5.2</i> )	13%	41%	45%
For others (n=288) ( <i>q 8.5.3</i> )	27%	45%	29%

<b>Table 6.21.2. Respondent view: Ease of understanding an SDS: Transport</b>			
	1 = Not easy at all	2 = Moderate	3 = Very easy
For self (n=290) ( <i>q 8.5.2</i> )	10%	35%	56%
For others (n=288) ( <i>q 8.5.3</i> )	18%	51%	31%

<b>Table 6.21.3. Respondent view: Ease of understanding an SDS: Agriculture</b>			
	1 = Not easy at all	2 = Moderate	3 = Very easy
For self (n=290) ( <i>q 8.5.2</i> )	39%	31%	30%
For others (n=288) ( <i>q 8.5.3</i> )	49%	31%	20%

Workers, when asked if they found the SDS's easy to understand (*question 8.5.2*) tended to agree (Table 6.21). Agricultural workers were less likely to consider SDSs very easy to understand for themselves (Pearson  $\chi^2 = 27.07$ ;  $p < 0.001$ ) or for co-workers (Pearson  $\chi^2 = 16.84$ ;  $p = 0.002$ ).

This may simply reflect the weakness of the question as a survey tool, notwithstanding its common use in other studies. Notably, when asked if co-workers would understand (*question 8.5.3*),

The percentage for reported comprehensibility to others was lower for all three sectors, which may suggest a respondent bias in that workers over-estimated their own ability to understand SDSs. Given low levels of comprehension of hazard statements and information in the SDS indicated in Tables 6.19 through 6.19.4 and Section 6.7 above, workers' self report of comprehension may not be an adequate indicator of comprehension.

In addition, despite the high proportion indicating that they did not have problems with SDS's (71%), 65% of all respondents (67% industry, 57% transport, 67% agriculture) indicated that SDSs could be made significantly easier (*question 8.5.4*). The two worker groups both indicated problems with the SDSs being too complex and one strongly motivated that the SDS be summarised if they were going to be able to use it. No differences were reported across job categories for the frequency and types of problems experienced.

Suggestions for improving the ease of SDS's and problems identified with SDS's are listed in the tables below.

<b>Table 6.22. Total. SDSs: Problems and Suggestions</b>			
Problems ( <i>q 8.5.5</i> ) (n=76)		Suggestions ( <i>q 8.5.4</i> ) (n=200)	
Languages and words too complicated	46%	Simpler language/wording	49%
Lacks language respondent can understand	36%	More languages (other than Eng)	23%
Too much data	7%	Summarise the data (too long)	15%
Not suited for illiterate person	4%	Include symbols	14%
Other: (includes unsuited for training, or PPE use, print too small, no UN #)	7%	Include colour coding	3.5%
		Training	14%
		Other (e.g. provide a glossary)	2.5%

<b>Table 6.22.1. SDSs: Problems and Suggestions: Industry</b>			
Problems ( <i>q 8.5.5</i> ) (n=35)		Suggestions ( <i>q 8.5.4</i> ) (n=116)	
Languages and words too complicated	49%	Simpler language/wording	53%
Lacks language respondent can understand	31%	More languages (other than Eng)	15%
Too much data	17%	Summarise the data (too long)	17%
Not suited for illiterate person	-	Include symbols	18%
Other: (includes unsuited for training, or PPE use, print too small, no UN #)	14%	Include colour coding	3%
		Training	14%
		Other (e.g. provide a glossary)	3%

<b>Table 6.22.2. SDSs: Problems and Suggestions: Transport.</b>			
Problems ( <i>q 8.5.5</i> ) (n=16)		Suggestions ( <i>q 8.5.4</i> ) (n=42)	
Languages and words too complicated	56%	Simpler language/wording	40%
Lacks language respondent can understand	25%	More languages (other than Eng)	31%
Too much data	6%	Summarise the data (too long)	17%
Not suited for illiterate person	-	Include symbols	12%
Other: (includes unsuited for training, or PPE use, print too small, no UN #)	6%	Include colour coding	5%
		Training	19%
		Other (e.g. provide a glossary)	2%

<b>Table 6.22.3. SDSs: Problems and Suggestions: Agriculture</b>			
Problems ( <i>q 8.5.5</i> ) (n=25)		Suggestions ( <i>q 8.5.4</i> ) (n=42)	
Languages and words too complicated	36%	Simpler language/wording	50%
Lacks language respondent can understand	48%	More languages (other than Eng)	38%
Too much data	4%	Summarise the data (too long)	7%
Not suited for illiterate person	12%	Include symbols	5%
Other: (includes unsuited for training, or PPE use, print too small, no UN #)	-	Include colour coding	2%
		Training	10%
		Other (e.g. provide a glossary)	-

The biggest concerns expressed related to language, either that language was too complex or that the language used was not understandable to readers. This was the case across all sectors.

<b>Table 6.23. Problems experienced with labels</b>	
Problems (q 8.5.5)	
Languages and words too complicated	7%
Lacks language respondent can understand	6%
Too much data	0.2%
Not suited for illiterate person	3%
Other:	7%

<b>Table 6.23.1. Problems experienced with labels: Industry</b>	
Problems (q 8.5.5)	
Languages and words too complicated	6%
Lacks language respondent can understand	6%
Too much data	-
Not suited for illiterate person	3%
Other:	3%

<b>Table 6.23.2. Problems experienced with labels: Transport</b>	
Problems (q 8.5.5)	
Languages and words too complicated	4%
Lacks language respondent can understand	4%
Too much data	-
Not suited for illiterate person	1%
Other:	4%

<b>Table 6.23.3. Problems experienced with labels: Agriculture</b>	
Problems (q 8.5.5)	
Languages and words too complicated	16%
Lacks language respondent can understand	9%
Too much data	-
Not suited for illiterate person	5%
Other:	8%

<b>Table 6.23.4. Problems experienced with labels: Consumers</b>	
Problems (q 8.5.5)	
Languages and words too complicated	3%
Lacks language respondent can understand	7%
Too much data	1%
Not suited for illiterate person	3%
Other:	13%

One consumer respondent suggested that information should be provided to consumers buying chemical products at retail outlets, through dedicated personnel for that task.

## 6.9 \*Training

### 6.9.1 Influence Previous Training

Previous training in health and safety (*questions 10.3.1 and 10.3.2*) was strongly associated with most comprehensibility outcomes, as well as usage of hazard information. Compared to the overall percentage of training (43% in the sample), over 96% of those who reported SDSs as unprompted sources of hazard information, and 100% of those who identified training as an unprompted source of hazard information (*question 2.6.2*) had previously received training.

The benefits of training applied across all sectors, even though training levels were much lower in agriculture and consumer sectors.

Trained respondents were also more likely to identify the active ingredient from a label (18% versus 7%), were half as likely to indicate they did not understand words on a label and were less likely to associate the skull and crossbones symbol with death (a common 'partly correct' error).

Trained respondents were more likely to indicate regular use of label information (66%) than non-trained (35%) and were less likely (29% versus 46%) to indicate they used labels to find instructions for use. Instead, trained respondents used labels to find other kinds of information, specifically hazard information (10%), product composition (9%) and product identification (17%).

Trained respondents were also 5 times more likely to recognise an SDS, 4 times more likely to be able to name it, and 6 times more likely to use it regularly. In the testing situation, trained respondents also used the SDSs and labels more frequently than others. In explaining hazard statements, hazard symbols and pictograms, trained respondents also tended to have slightly higher correct and far fewer 'don't know' responses. Trained respondents also were able to identify a chemical as hazardous more easily than non-trained respondents. Problems with labels were reported as less common amongst trained respondents (9%) than untrained (25%).

### 6.9.2 Impact of Short Training

Short training took the form of a brief explanation to 196 respondents as to the meanings of symbols and hazard information at the outset of the last module. This was tested by comparing responses within individuals to their own earlier answers to the same questions in module 3, and between individuals to those who did not receive training in module 10 (n=206) (Tables 6.24 through 6.24.4).

<b>Table 6.24. Impact on training on selected hazard information comprehension</b>				
	Training		No Training	
	Critical confusions	% Correct or partly correct	Critical confusions	% correct or partly correct
Skull and crossbones (q 10.6.2)	1	95% (n=170)	0	91% (n=188)
Flammable symbol (q 10.6.2)	0	98% (n=196)	0	95% (n=206)
Environmental hazard symbol (q 10.6.2)	3	87% (n=196)	1	79% (n=202)
Signal word Danger (q 10.6.3)	0	88% (n=194)	0	91% (n=201)
Hazard statement: Corrosive to metal and skin (q 10.6.4)	0	82% (n=193)	0	80% (n=198)
Chronic symbol (q 10.6.2)	0	28% (n=196)	1	11% (n=206)
	4		2	

	Training		No Training	
	Critical confusions	% Correct or partly correct	Critical confusions	% correct or partly correct
Skull and crossbones (q 10.6.2)	1	97% (n=90)	0	92% (n=65)
Flammable symbol (q 10.6.2)	0	98% (n=99)	0	97% (n=77)
Environmental hazard symbol (q 10.6.2)	2	87% (n=99)	0	84% (n=74)
Signal word Danger (q 10.6.3)	0	87% (n=97)	0	95% (n=74)
Hazard statement: Corrosive to metal and skin (q 10.6.4)	0	87% (n=97)	0	97% (n=72)
Chronic symbol (q 10.6.2)	0	27% (n=99)	0	16% (n=77)
	3		0	

	Training		No Training	
	Critical confusions	% Correct or partly correct	Critical confusions	% correct or partly correct
Skull and crossbones (q 10.6.2)	0	90% (n=10)	0	84% (n=56)
Flammable symbol (q 10.6.2)	0	100% (n=13)	0	93% (n=59)
Environmental hazard symbol (q 10.6.2)	1	77% (n=13)	0	71% (n=59)
Signal word Danger (q 10.6.3)	0	100% (n=13)	0	93% (n=59)
Hazard statement: Corrosive to metal and skin (q 10.6.4)	0	92% (n=13)	0	93% (n=58)
Chronic symbol (q 10.6.2)	0	38% (n=13)	1	14% (n=59)
	1		1	

<b>Table 6.24.3. Impact on training on selected hazard information comprehension: Agriculture</b>				
	Training		No Training	
	Critical confusions	% Correct or partly correct	Critical confusions	% correct or partly correct
Skull and crossbones (q 10.6.2)	0	89% (n=28)	0	97% (n=30)
Flammable symbol (q 10.6.2)	0	94% (n=35)	0	94% (n=32)
Environmental hazard symbol (q 10.6.2)	0	89% (n=35)	1	81% (n=31)
Signal word Danger (q 10.6.3)	0	86% (n=35)	0	87% (n=30)
Hazard statement: Corrosive to metal and skin (q 10.6.4)	0	56% (n=34)	0	73% (n=30)
Chronic symbol (q 10.6.2)	0	34% (n=35)	0	25% (n=32)
	0		0	

<b>Table 6.24.4. Impact on training on selected hazard information comprehension: Consumer</b>				
	Training		No Training	
	Critical confusions	% Correct or partly correct	Critical confusions	% correct or partly correct
Skull and crossbones (q 10.6.2)	0	98% (n=42)	0	97% (n=37)
Flammable symbol (q 10.6.2)	0	100% (n=49)	0	92% (n=38)
Environmental hazard symbol (q 10.6.2)	0	90% (n=49)	0	79% (n=38)
Signal word Danger (q 10.6.3)	0	90% (n=49)	0	84% (n=38)
Hazard statement: Corrosive to metal and skin (q 10.6.4)	0	90% (n=49)	0	87% (n=38)
Chronic symbol (q 10.6.2)	0	20% (n=49)	0	13% (n=38)
	0		0	

No evident differences are seen in the comprehension of the two groups for most of the items. Comprehension for all items, except the chronic icon, appeared good in this module, which was a repeat of earlier questions asked of participants, irrespective of training or of sector.

The chronic health hazards icon, to which almost all respondents will be naïve in South Africa, was better understood across all sectors by those who received training but these differences were not statistically significant.

There were few critical confusions amongst this group. In total, the non-training group reported 4 critical confusions compared to 2 in the trained group.

When subjects are compared to their own answers in module 3, the change in knowledge is more evident (Tables 6.25 through 6.25.4). Increased in reported understanding occurred in both groups but marginally more evidently in the trained group. Critical confusions reduced markedly in the trained group.

Item <i>(pre-training: q 3.4.1)</i> <i>(post-training: q 10.6.2)</i>	Training		No Training	
	Module 3 (pre-training)	Module 10 (post-training)	Module 3 (pre-training)	Module 10 (post-training)
Skull and Crossbones: Correct	97% (n=159)	95% (n=170)	99% (n=187)	91% (n=188)
Skull and Crossbones: Critical confusions	2	1	0	0
Flammable: Correct	93% (n=196)	98% (n=196)	94% (n=206)	95% (n=206)
Flammable: Critical confusions	0	0	1	0
Environmental: Correct	60% (n=196)	87% (n=196)	53% (n=206)	79% (n=202)
Environmental: Critical confusions	14	3	1	1
Environmental: incorrect	9% (n=196)	7% (n=196)	20% (n=206)	12% (n=202)
Environmental: 'Don't know'	24% (n=196)	5% (n=196)	28% (n=206)	9% (n=202)
Total Critical Confusion	16	4	2	

Item <i>(pre-training: q 3.4.1)</i> <i>(post-training: q 10.6.2)</i>	Training		No Training	
	Module 3 (pre-training)	Module 10 (post-training)	Module 3 (pre-training)	Module 10 (post-training)
Skull and Crossbones: Correct	96% (n=84)	97% (n=90)	100% (n=70)	92% (n=65)
Skull and Crossbones: Critical confusions	1	1	0	0
Flammable: Correct	94% (n=99)	98% (n=99)	95% (n=77)	97% (n=77)
Flammable: Critical confusions	0	0	0	0
Environmental: Correct	56% (n=99)	87% (n=99)	57% (n=77)	84% (n=74)
Environmental: Critical confusions	8	2	1	0
Environmental: incorrect	10% (n=99)	6% (n=99)	13% (n=77)	7% (n=74)
Environmental: 'Don't know'	26% (n=99)	5% (n=99)	29% (n=77)	9% (n=74)
Total Critical Confusion	9	3	1	0

Item <i>(pre-training: q 3.4.1)</i> <i>(post-training: q 10.6.2)</i>	Training		No Training	
	Module 3 (pre-training)	Module 10 (post-training)	Module 3 (pre-training)	Module 10 (post-training)
Skull and Crossbones: Correct	100% (n=10)	90% (n=10)	100% (n=52)	84% (n=56)
Skull and Crossbones: Critical confusions	0	0	0	0
Flammable: Correct	100% (n=13)	100% (n=13)	90% (n=59)	93% (n=59)
Flammable: Critical confusions	0	0	1	0
Environmental: Correct	61%	77%	56%	71%

	(n=13)	(n=13)	(n=59)	(n=59)
Environmental: Critical confusions	2	1	0	0
Environmental: incorrect	8%	8%	22%	19%
	(n=13)	(n=13)	(n=59)	(n=59)
Environmental: 'Don't know'	15%	8%	25%	10%
	(n=13)	(n=13)	(n=59)	(n=59)
Total Critical Confusion	2	1	1	0

<b>Table 6.25.3. Knowledge parameters compared before and after training: Agriculture</b>				
Item	Training		No Training	
	Module 3 (pre-training)	Module 10 (post-training)	Module 3 (pre-training)	Module 10 (post-training)
<i>(pre-training: q 3.4.1)</i> <i>(post-training: q 10.6.2)</i>				
Skull and Crossbones: Correct	96% (n=28)	89% (n=28)	97% (n=31)	97% (n=30)
Skull and Crossbones: Critical confusions	0	0	0	0
Flammable: Correct	89% (n=35)	94% (n=35)	91% (n=32)	94% (n=32)
Flammable: Critical confusions	0	0	0	0
Environmental: Correct	66% (n=35)	89% (n=35)	41% (n=32)	81% (n=31)
Environmental: Critical confusions	3	0	0	2
Environmental: incorrect	9% (n=35)	6% (n=35)	38% (n=32)	13% (n=31)
Environmental: 'Don't know'	17% (n=35)	6% (n=35)	22% (n=32)	3% (n=31)
Total Critical Confusion	3	0	0	3

<b>Table 6.25.4. Knowledge parameters compared before and after training: Consumer</b>				
Item	Training		No Training	
	Module 3 (pre-training)	Module 10 (post-training)	Module 3 (pre-training)	Module 10 (post-training)
<i>(pre-training: q 3.4.1)</i> <i>(post-training: q 10.6.2)</i>				
Skull and Crossbones: Correct	97% (n=37)	98% (n=42)	100% (n=34)	97% (n=37)
Skull and Crossbones: Critical confusions	1	0	0	0
Flammable: Correct	94% (n=49)	100% (n=49)	100% (n=38)	92% (n=32)
Flammable: Critical confusions	0	0	0	0
Environmental: Correct	63% (n=49)	90% (n=49)	50% (n=38)	81% (n=31)
Environmental: Critical confusions	1	0	0	0
Environmental: incorrect	8% (n=49)	8% (n=49)	12% (n=38)	11% (n=31)
Environmental: 'Don't know'	27% (n=49)	2% (n=49)	27% (n=38)	11% (n=31)
Total Critical Confusion	2	0	0	0