Can We Reduce Workplace Fatalities by Half?

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Introduction

When considering an answer to the question “Can we reduce workplace fatalities by half?”, several questions can be raised. Possibly the two most pertinent considerations are what is the parameter being measured, and how long is the time frame for the change to occur.

Firstly, which parameter is being measured? Do we measure the absolute number of fatalities in the workplace, or the rate of workplace fatalities? The absolute number of fatalities may change as a result of changes in the number of workers at risk or changes in the nature of work or the quantity of work done. However, the absolute numbers have a direct impact as it measures the actual number of deaths that have occurred, and high numbers may be unacceptable, whatever the rate is. For comparison purposes, determining a rate is generally preferred over measuring absolute numbers, since the rate takes into account the number of workers at risk, or the total person time exposure. If we decide to measure the rate of workplace fatalities, another consideration would be which denominator to use. There are several possible denominators, e.g., the man-days or man hours worked, or the workforce population. Furthermore, as the risk of workplace fatality varies by the type of work, examining the rates by the various types or sectors of work (e.g., construction, shipbuilding and repair, manufacturing) may give a better picture of the experience in specific individual workplace sectors.

Secondly, what time frame should be allocated for the
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reduction in fatalities to occur by half? An ideal time frame is one which is challenging and ambitious, but yet is also realistic and within reach. Such a time frame, usually measured in years, would also depend on what is the original baseline fatality rate. If the baseline fatality rate is high, there would be some urgency to reduce the fatality in a short time frame. There may possibly be less urgency if the baseline is extremely low. Moreover, it is likely that the lower the initial or baseline fatality rate, the more challenging it will be (i.e., a longer period of time may be needed) to reduce workplace fatality rates by half. Very low rates would also be unstable, and can fluctuate widely even if the absolute number of fatalities changes by a small amount.

This paper described the experience of Singapore in reducing the national workplace fatality rate from 4.9 per 100,000 workers in 2004, when there were 83 fatalities, to 2.2 per 100,000 workers in 2010, when there were 54 workplace deaths.

Occupations in Singapore

Singapore is a densely populated tropical island Republic with an area of 710 square kilometers. It has a total population of 5.1 million people and a workforce of 3.1 million in 2010 [1]. Most employed people work in the service sector, which employed 2.15 million people out of the 3.1 million workers in December 2010.

There is a large service sector in Singapore. It is the world’s fourth leading financial center, and second biggest casino gambling market. The economy also depends heavily on exports and refining imported goods, especially in manufacturing, which accounted for 27.2% of the gross domestic product (GDP) in 2010. Activities in the manufacturing sector include electronics, petroleum refining, chemicals, mechanical engineering, and biomedical sciences.

Singapore produced about 10% of the world’s foundry wafer output in 2006. It is currently one of the world’s top 3 oil refining centers and the world’s largest oil rig producer. It is also a major ship repairing nation and one of the 5 busiest ports in the world. Construction is another major industry, employing mostly migrant workers. In 2009, total employment in the construction sector was 385,000 workers, and this sector contributed 6.2% towards the country’s GDP [2].

Workplace Accident Rates

The accident frequency rate in Singapore has declined since the 1980s, but the rate of decline has been uneven. From 1980 to 1986, the accident frequency rate (number of accidents per million man-hours worked) dropped steadily from 6.5 to 4.0 (Fig. 1) [3]. The accident frequency rate then remained stable at 4.0 until 1992, when it further decreased from 4.0 to approximately 2.2 in the years 2000 to 2004.

In 2004, several major accidents in Singapore occurred, involving the building of a subway system at Nicoll Highway, the construction of buildings located at the Fusionpolis, the financial district of One Raffles Quay, and work at a large shipyard (Keppel Shipyard). These incidents alone claimed 13 lives. The high profile accidents shook national confidence in workplace safety and health (WSH), and raised public expectations for higher standards. These events also highlighted the high business and opportunity costs of workplace accidents.

These incidents led to a call by the then Minister of Manpower to reduce workplace fatalities by half from the rate of 4.9 per 100,000 workers in 2004. The target set by the Manpower Minister was to achieve a workplace fatality rate of 2.5 fatalities per 100,000 by the year 2015. The aim then was for Singapore to attain the benchmarks of the top 10 developed countries in 2004 (Table 1).

A National Plan and Strategies to Halve the Workplace Fatality Rate

With a strong political will to achieve the target, what followed was the preparation of a national plan of action. A national vision was crafted, to have a “safe and healthy workplace for everyone and a country renowned for best practices in WSH.” The desired outcomes were a reduction in workplace fatality and injury rates, to have WSH as an integral part of business, and to acquire a progressive and pervasive WSH culture in the
The strategies to achieve these goals were to build capabilities to manage WSH, to effect WSH legislative changes and implement an effective regulatory framework, to promote the benefits and recognize best practices in WSH, and to integrate WSH into business. The development of strong partnerships with all relevant stakeholders was an integral part of the plan [4].

In addition to a national plan, there were also plans and targets developed specifically for important sectors in the country. These plans were updated periodically. For example, the plan for the construction sector [2] noted that in 2009, the fatality rate in the sector was 8.1 per 100,000 workers, and the injury rate was 741 per 100,000 workers, which was above the national average of 446 per 100,000 workers. The explicit target set for the construction sector was to achieve a fatality rate of less than 3.4 per 100,000 workers and an injury rate of less than 390 by 2013, and to further reduce this to a fatality rate of 1.8 and an injury rate of less than 200 by 2018.

Building WSH Capability

In the process of building capabilities, a National WSH Advisory Committee was formed in 2005. This was the forerunner of the WSH Council (WSHC), which came into existence in 2008. The council members were from major industry divisions (construction, manufacturing, marine industries, petrochemicals, and logistics), the government, the trade unions and professionals from the legal, insurance and academic fields. It works with the Ministry of Manpower and other Government agencies, and other stakeholders to raise WSH standards in Singapore.

Several industry committees (construction, chemicals, healthcare, transport, marine, metalworking), functional committees (health, engagement, capability building) and taskforces (crane safety, working at height) were created to address specific and priority WSH challenges.

As an example, the Work at Height (WAH) Taskforce offered industry leadership and worked with the Ministry of Manpower and the WSHC to produce recommendations to improve safety for WAH; and provided inputs for the implementation plans for each recommendation. It also gathered support from industries for effective implementation of recommendations and served as a spokesperson at relevant engagement events.

The WSHC also oversaw the preparation of Approved Codes of Practice, guidelines and non-technical advice on WSH matters, as well as Technical Advisories which provided detailed guidance on technical issues or where engineering and scientific methods are involved.

In parallel, an International Advisory panel within WSH was appointed. This panel comprised WSH leaders of global stature. It advised the government on the approaches for achieving its WSH vision and gave comments on the progress made. The panel met in 2006, 2008, 2010 and 2011. Finally, a national Workplace Safety and Health Institute was established in 2011.

At the same time, the number of trained WSH professionals to serve the needs of industry grew. The number of such professionals registered with the Ministry of Manpower increased by 82% in five years - from over a thousand WSH officers in 2005 to over 2000 in 2010.

Legislative Changes and Enforcement

In 2006, the country’s Factories Act, which only applied to some workplaces in Singapore, was replaced with a comprehensive Act which covered all workplaces. The Workplace Safety and Health Act 2006 (No. 7 of 2006) was passed by the Singapore Parliament on Jan 17, 2006 and assented by the President on Feb 6, 2006.

In addition to the increased coverage of workplaces, the penalties for violations of the Act were significantly raised [5]. In response to the new legislation, staff strength in the government’s Occupational Safety and Health Division (OSHD) increased. This division was responsible for enforcing the legislation. The increase in staff strength in the OSHD was in contrast to staffing numbers in other government departments, which showed no change or even a decline.

The Ministry of Manpower strengthened its operational capabilities, focused on training and developing its inspectors, and increased its industry engagement. Inspection protocols for new sectors covered by the Act were developed. The Ministry of Manpower also had a joint framework to partner with

| Country/region | Fatality rate per 100,000 workers (year of data) |
|----------------|-----------------------------------------------|
| Sweden         | 1.0 (2004)                                    |
| UK             | 1.4 (2004)                                    |
| USA            | 2.1 (2005)                                    |
| Japan          | 2.2 (2004)                                    |
| EU average     | 2.5 (2004)                                    |
| Singapore      | 4.9 (2004)                                    |
other government agencies such as the Singapore Civil Defence Force and the National Environment Agency to better manage risks posed by industry.

The Ministry of Manpower also worked with the WSHC in areas such as Programmed-Based Engagement (ProBE), which targets priority sectors such as hotspots, high risk industries, workplaces with high accident rates, and high risk occupations. The ProBE program has three phases. In phase 1, there was work with key partners to identify ground issues. Phase 2 was to communicate and further extend engagement efforts for ProBE initiatives. Phase 3 was the enforcement and monitoring stage for review and reinforcement in the target groups and for scrutinizing outcomes [6].

Besides conducting investigations of accidents, and looking into notifications and complaints from the public, other schemes were launched. This included the Business Under Surveillance initiative, where companies with poor WSH performance were subjected to increased engagement, close monitoring, and enforcement.

The enforcement measures included the issuing of advisory letters, warning letters, and Notices of Non-Compliance. Workplaces which had more serious transgressions of the law were issued Stop Work Orders or Remedial Orders. Serious offenders were punished with demerit points, awarded composition fines or legally prosecuted. Cases of WSH violations and prosecutions were highlighted in the local media, to raise public awareness of the actions taken and to shame the wrongdoers.

Concurrently, constant review and updating of the legislative framework continues, with several changes introduced annually (Table 2).

### Promoting Benefits and Recognizing Best Practices

This was another important strategy which was pursued and implemented. The aim was to promote a better understanding of the benefits of good WSH performance among employers. WSH was shown to enhance business value by creating a good corporate image, and results in cost savings through higher productivity and reduced work disruptions from accidents. Sharing of best practices was encouraged to promote cross industry learning and to facilitate an environment of continuous improvement.

Organizations as well as individuals were recognized for their efforts in promoting WSH, and awards were given at national events. There was extensive media coverage to highlight these activities, and the events were given prominence by the government and national leadership. For example, the National Workplace Safety and Health Campaign in 2008 was launched by the Prime Minister of Singapore.

### Partnership with Stakeholders

A key factor to ensure success in reducing workplace fatalities was to engage and partner all relevant parties. A participatory approach was adopted, involving all stakeholders such as the government, the WSHC, employers, unions, WSH professionals and service providers, professional organizations, insurance providers, educational institutions, and employees.

Compared to the earlier years, many more public consultations were held and more outreach and education events were organized. Partnerships and collaborations were also enhanced

| Table 2. Changes in workplace safety and health legislation in Singapore, 2006-2011 |
|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|
| WSH Act | WSH Act (Amendment) to include 6 new sectors | WSH Act (Amendment) to include all workplaces |
| WSH (general provisions) Regulations | WSH (construction) Regulations | Work Injury Compensation Act | WSH (confined spaces) Regulations | WSH (SHMS and auditing) Regulations | WSH (general provisions) Regulations |
| WSH (incident reporting) Regulations | WSH (registration of factories) | Workplace Injury Compensation (insurance) Regulations | WSH (noise) Regulations |
| WSH (risk management) Regulations | WSH (ship-building and ship repairing) Regulations | WSH (medical examinations) Regulations |

WSH: workplace safety and health, SHMS: safety and health management system.
not only nationally, but internationally as well.

**Monitoring of Outcome**

With the introduction of all the above measures, which is much more than the activities and actions implemented before 2004, the workplace fatality rate declined steadily from 4.9 per 100,000 workers in 2004 to 2.2 per 100,000 in 2010 (Table 3) [7-9]. The workplace fatality rate was halved by 2010, and this achievement was attained 5 years ahead of the original target date that was set.

Several potential confounding factors could account for the reduction in fatalities observed. For example, factors which impacted the fatality rate could be due to changes in the reporting systems, or inconsistencies and misreporting of events regarding fatal workplace events. However, there were no changes in the reporting system for workplace fatalities in Singapore over these years, and fatal workplace accidents are usually completely captured in the notification system within this small country. Another confounding factor could be a change in the composition of the workforce over that period of time, e.g., an increase in the workforce proportion of multinational companies, which have their own health and safety systems generally having better safety and health performance, could result in a lowering of workplace fatality rates. The level of worker representative involvement in driving up health and safety performance could yet be another factor resulting in an improvement regarding fatality rates.

In addition, other parameters, if available, would provide further objective evidence to support the hypothesis that the interventions described produced the effect observed. Such supporting evidence could include: (a) how the work of the additional WSH professionals with the Ministry of Manpower was organized to deliver the desired outcomes, (b) how the number of duty holder interactions was affected, and (c) the number of enforcement measures over the period, e.g., the issuing of advisory letters, warning letters and notices of non-compliance and stop work orders. Unfortunately, such information during 2004-2010 was not available in the public domain. Additionally, surveys on awareness of WSH regulations could have been carried out over the period to show that the information provided by the enforcing authorities was being used and understood by the duty holders.

The trend in fatality rate will continue to be monitored in subsequent years, as the current efforts may have short-term effects on injuries and may not produce sustainable reductions in workplace fatality rates. It is likely that the efforts to reduce the fatality rate further will be increasingly challenging as the rates approach zero. Reliance not only on legislation and administrative measures, but also on engineering controls will be needed to provide long-term impacts towards injury and fatality controls.

**What’s Next?**

While it is commendable to have reduced the workplace fatality rate by half in 6 years, the workplace fatality rate of 2.2 per 100,000 can still be reduced further. For instance, in 2004, Sweden had a workplace fatality rate of 1.0 while the UK had a rate of 1.4. As such, a new target has been set by the Prime Minister of Singapore. During the National Workplace Safety and Health Campaign of 2008, Prime Minister Lee stated that “We should set a more ambitious goal, to reduce the rate to 1.8 fatalities per 100,000 within a decade. We should aim to have one of the best workplace safety records in the world.” [4].

To achieve this goal, new strategies and approaches may have to be adopted. As we progress further, and as WSH climates and situations improve, perhaps the parameters to be measured, and the time frames set should also be reviewed. The ultimate goal is of course, to achieve not only zero fatalities, but also zero injuries and zero accidents. Finally, other relevant indicators, such as the burden of occupational or work related diseases, and its appropriate indicators should also be monitored.

**Conflict of Interest**

No potential conflict of interest relevant to this article was re-

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**Table 3. Workplace fatalities and fatality rates in Singapore, 2004-2011**

| Year | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|------|------|------|------|------|------|------|------|
| Number of fatalities | 83   | 71   | 62   | 63   | 67   | 70   | 54   |
| *Fatality rate* | 4.9  | 4.0  | 3.1  | 2.9  | 2.8  | 2.9  | 2.2  |

*per 100,000 persons employed.
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