Priorities For Occupational Injury Surveillance In The 21st Century: The Need To Improve Information For Non-fatal Injuries

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And so what I wanted to do today -- just to give you a bit of an overview of what I want to try and do today -- is review the limitations of available injury data on occupational injuries, and particularly to emphasize to you the value of population-based surveillance as against work-place-based surveillance; describe the contribution of injuries at work to the total burden of working age adults; examine if injuries on and off the job share certain common characteristics. And then, also to think of, what is the impact of off-the-job injuries on the workplace, and maybe it’s in the interests of employers to start thinking about off-the-job injury prevention as well as on-the-job injury prevention. And as part of this, to sort of propose a new dimension to our approaches to the surveillance and prevention of both on- and off-the-job injuries and to see whether it makes sense to have this really artificial-gulf separation between the two -- or maybe that we could be taking a broader approach to looking at this problem.
So the first primary question that I’ve used for years in talks is this -- how dangerous is your job? Can we actually tell you how dangerous your job is? And this is what got me interested in this whole issue of, sort of, work and non-work and work injury surveillance.
Back in 1980 when I started doing some of this research in the area, we couldn’t even answer this question for fatalities. We had this incredible slide – and I loved using this slide – where we had this estimate from the Bureau of Labor Statistics of 2,300 people each year were killed on the job from work-related injury fatalities. And the National Safety Council had an estimate of 13,000 people killed on the job. And we’re not talking about some vague occupational toxic fume exposure, the risk of cancer, or the risk of ‘this’ disease. We’re talking of acute exposure on the job that usually people die within a day or so of the injury. So it’s usually a no-brainer to decide if it was work related. But seemingly, nationally, we had this major problem.

In 1987, there were two major reports that came out – the National Academy of Sciences and the Keystone Dialogue Group – which actually addressed this and said this is absolutely scandalous, that we can’t even count the number of people they had killed on the job.

As a result of this, we established two national fatality systems, and I’m going to go through these just briefly – and this issue, with regard to our quality of work-related injury data was clearly recognized by the NORA research agenda team – and I was part of the traumatic injury team.
We recognized even then, despite some advances in the fatality data, there were still major deficiencies in the data quality and that improved surveillance is the major driving force behind research and prevention efforts.

But for non-fatal injuries, we still have a major problem, and we can’t – even to this day – tell you how many people get hospitalized for work-related injuries. Absolutely amazing!
We'll move on to the next thing, just to review some of our success stories, because we shouldn't be negative all the time.

Vital statistics – it captures all deaths in the US – and for years and years, there was an injury box – an injury-at-work box – on the death certificate. But unfortunately, it wasn’t even entered by the vital statistics department – it wasn’t available at a national level. Many states entered it, but the National Center for Health Statistics didn’t pay the states for this data, because they pay by each variable, and as a result it wasn’t available at the National Level.

NIOSH is part of their effort to address this issue. They were the first to really take it head-on. They actually went back to the states and bought individual certificates from the states where the injury-at-work box was marked yes. This has really formed the basis of the National Traumatic Occupational Fatality System – NTOF – which was really ground-breaking when it was begun.
And some interesting things – it also includes free text, which is another important area. Anybody doing any occupational injury or injury surveillance system should be looking at what you can get out of the free text information. For example, there was one study – I remember being asked to review very early on – which was looking at tractor deaths and tractor deaths on the farm get classified as machinery injuries in a whole different part of the ICD coding system, but if it occurs on the highway, it gets classified as a motor vehicle injury in a whole major different section of the ICD classification system. Only by looking for the words tractor, farm, and various things, they were able to come up with some estimate as to how many of the highway injuries were actually farm tractors. So we’re greatly underestimating the problem.

The data starts in 1980 and provides – we’re going back for a long time – provides some very useful data to be able to generate trends.
This is what we get when we compare data. This is the year when people were starting to make the same estimates, just before the National Safety Council moved over to the other system I’m going to talk about. But in 1998, the Bureau of Labor statistics said this many injuries. The National Safety Council, NTOF. And when they eventually managed to get enough NTOF data together, they estimated about – somewhere in between.

So many of us have been concerned that the National Safety Council estimate was actually much higher than it probably should have been, and if you look at the data now, they now use this new system, which is – sorry, this is just showing you the kind of stuff from NIOSH with the trends.

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<thead>
<tr>
<th>Source</th>
<th>Number</th>
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<tr>
<td>National Safety Council</td>
<td>10,400*</td>
<td>1989</td>
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<td>NIOSH NTOF</td>
<td>5,710</td>
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*Estimate only
This is actually out of the newest NIOSH worker health chart book, which just came out. The pre-release copy was released a few weeks ago, and through Marilyn Fingerhut, who talked yesterday, I got a copy of some of the slides I could use.

This is showing the trends in the number of work-related fatalities using the NTOF data, both with the number and the rate. You can see there are dramatic declines that have occurred.
And one of the other things – are we using this data for prevention? Does it make any sense? Why do we collect this data?

And one of the first major things to come out of it was the looking at the injury fatality rates by state. Alaska had fatality rates that were just WAY off the chart compared to other states.
As a result of this, NIOSH launched a massive effort in Alaska to try and reduce work-related injury fatalities, and has had some real significant success and some dramatic declines in work-related injury fatalities there.

So, that’s the NTOF system, which still continues and reports and there’s a number of charts from it in the worker health chart book.
Census of Occupational Fatalities (CFOI)

- Bureau of Labor Statistics (BLS)
  - All reported occupational fatalities
  - Uses multiple sources. Includes:
    - Death certificates, medical examiner reports, newspaper clippings, OSHA reports etc
    - Estimates higher than NTOF
  - Extensive information available
    - Includes free text description
    - Data from 1992 on

- Relies on quality of sources
  - Improve “injury at work” on death certificates
  - Evaluation
    - Sentinel surveillance, evaluate sample all deaths for work relatedness
    - Medical examiners valuable resource

Separately, the Bureau of Labor Statistics – one of the problems with the NTOF system is that it still relies inherently on this injury-at-work box being check-marked yes. We’ve done some validation studies, and found that about 10 percent of the work-related injury deaths get missed by this, and it misses certain particular groups – older people, farmers, some of those kinds of things. And it also is just restricted to the amount of information that’s on the death certificate.

The Bureau of Labor Statistics set up their own system for all reported occupational fatalities. It’s really a census, and they call it a census of occupational fatalities. It uses multiple sources including death certificates, medical examiner, newspaper clipping – a whole variety of different sources – and as you might expect, their estimates are higher than NTOF. There is a lot of information available, extensive free text descriptions to how it occurred, and they have data from 1992 on. But like any of these systems, it’s reliant on the quality of the sources, and still relies a lot on the death certificate to identify cases.

My suspicion – and there hasn’t been much real validation of it – but there’s also variation between states. And in some states, they get a lot of other sources other than the death certificate, and in some states they’re reliant more on the death certificate. We’ve been proposing some various means that you might want to think about in terms of evaluating this system.
And this is just showing you – out of the same worker health chart book – the kind of data from the more recent years out of the BLS. As you can see, their figures were higher than the NIOSH figures there, and showing a similar kind of decline, particularly if you look at the rates.
This is also just showing you the states with the largest number of fatalities in 2002 – so they actually have data for very recent data, and I really commend them for that. And you can see, while Alaska has very high rates, it doesn't have such a large number of fatalities each year, and the number has come way down. But this just gives you an – and the number is both a function of the underlying rate and the underlying number of workers, working in that particular state.
That’s all very jolly, but the injury mortality is really just the tip of the iceberg.
And this is the classic iceberg thing that the injury prevention community have worked for all injuries, not just work-related injuries, where you sort of have the injury deaths on the top, you have hospital discharges at the bottom – we can't tell you how many of those are work-related. You have emergency department visits, and NIOSH has got some – I'll show you some stuff here, we're trying to catch that.

Then there's medically attended injuries, and then there's an even larger one in terms of various definitions; and it's particularly an issue when you come to look at what gets reported by the different systems as to what your definition of injury is. And I always say to people, when you think about an injury, you have to always be thinking about what – what do you define your injury?
Construction worker survives drill through head
TRUCKEE, California (AP) 9-3-03 CNN.com

- "The construction worker lost an eye but survived a freak accident without brain damage after falling from a ladder and onto an 18-inch-long drill bit that impaled his skull."
- "I'm very fortunate I'm not paralyzed or dead," the 41-year-old electrician said Friday.
- X-ray shows where the drill bit entered Hunt's head.

The 1.5-inch diameter chip auger drill bit was still in his head when his brother, Chris Hunt, and nephew, Ben, met him in a hospital emergency room in Reno, Nevada.
While drilling above his head on August 15, the six-foot ladder Ron Hunt was standing on started to wobble so he tossed the drill aside -- as construction workers are trained to do. But he fell off the ladder face-first and onto the drill.
"I ran my hands up the drill bit, up to my eye, and put my other hand in the back of my head and felt it coming through the back of my head," he said. "And that's where pretty much the shock set in."
Doctors said the drill bit pushed his brain aside rather than pushing into it, which likely would have caused serious brain damage or death. After weighing their options, doctors essentially unscrewed the bit to remove it.

So to start another scenario, I want to come up with an interesting case example that – we’ve been doing a separate study of falls from ladders. This was a fascinating story that we heard about on the news where a worker lost an eye but survived a so-called freak accident without brain damage. He fell from a ladder on to an 18-inch drill. The drill ended up going right through his eye – he lost his eye – through – it’s amazing, it tended to miss most of the vital structures. This is an x-ray of how it went through his head.

The reality is, he survived. He has fairly normal cognitive function as a result of this. But it’s a good example of – it’s clearly an acute exposure, clearly a work-related injury – but, would this case have been captured by the traditional occupational health surveillance systems?
Would this case have been captured by traditional occupational health surveillance systems?

- **Bureau of Labor Statistics**
  - Not reported in the Annual Survey if self-employed
    - many construction workers independent contractors

- **Workers’ compensation (WC) insurance databases**
  - Self-employed not covered by normal WC
    - individual medical policies not included
    - private disability plans not included

- **Not if it occurred off the job**

- **If person died work-relatedness captured**
  - Fatality reporting now population based
    - does not rely on workplace-based reporting

- **Population-based surveillance:**
  - A way to track all injuries on and off the job

The Bureau of Labor Statistics. It wouldn't be reported if the person was self-employed, and an awful lot of people employed in construction are self-employed. Even on major construction jobs, the people hanging the drywall are often independent contractors because it's cheaper and no one has to worry about health and safety – there’s a whole bunch of reasons as to why. So if that was the case, it wouldn’t have been captured by the Bureau of Labor Statistics.

Worker's Compensation Insurance databases. If they were self employed, they're often not covered by normal Worker's Comp, even in states that have compulsory Worker’s Comp, and the plans differ very much by state. If it occurred off the job while he was at home, it wouldn’t get reported, obviously, in the work-related systems, which is probably understandable.

And if the person died, the work-related would probably be captured pretty well. It made the news, it got news report – newspaper clippings – there’s a good chance somebody marked the injury-at-work box on the death certificate. But it really illustrates the value of my underlying premise, that we need to be thinking about population-based surveillance to track all injuries, and particularly if we're going to try and capture these people from the groups that get missed from the traditional work-place-based surveillance systems.
The traditional occupational injury surveillance systems for non-fatal injuries don’t provide a comprehensive picture of workplace injury, and we believe that potentially an increasing proportion of the workforce – and the less structured workforce – independent consultants seem to be increasing.

Even health departments and – I know in Massachusetts, many people in the health department are independent contractors in theory – sort of covering their own health insurance, all of their own benefits.

There’s often incomplete representation of occupation industry groups. Some groups are going to be covered by the reporting systems, and some aren’t. There will be biases in the capture by severity, by the group that’s being reported. And basic premise is, that they do not assess all injuries from a specific cause in the population for work-relatedness.
Current Occupational Injury Data Sources (non-fatal)

- Bureau of Labor Statistics
  - estimates 6 million injuries on the job

- Workers’ compensation/insurance databases
  - many groups not covered

- Data systems separate from other health system based surveillance
The Bureau of Labor Statistics – a survey of occupational injuries – this is just to give you a bit of a background. Many of you probably know this. It’s a sample of a number of workplaces around the country. It’s representative of the covered injuries in each state – and I say it’s those covered by the survey. It’s employees of private companies only. And when you see the data, it says “private industry” – but the reality is many people, when they look at it, don’t realize it’s private industry only and think that these are the numbers for the U.S. It’s based on injuries reportable in the OSHA log, excludes farms with ten or less employees, private household workers, federal, state and local government, and self-employed people – so, quite a large sector of the workforce.
There have been studies that have been done that estimate up to 200% underreporting, and below there, there’s a couple of examples of the recent articles that have looked at this issue.

Estimates of the number of people with non-fatal injuries on the job range from 6,000,000 to 13,000,000 – looks very similar to the fatality data that we had a few years ago, doesn’t it? And the reasons for – there’s under-reporting, there’s confusion as to what’s reportable.

You’ve all heard the various companies being hit up for major reporting violations over the years. There are economic disincentives to report – one during the Reagan administration that there were a number of companies accused of having multiple injury books that they – if OSHA came in and they found that your injury rate was below the industry standard, the inspector would turn around and walk out again. And so it’s a tremendous incentive for having your rate lower than the industry average, and they estimate that 20 percent of the workforce are not covered.
Underreporting by workers’ compensation insurance

- Workers’ Compensation (WC) claims commonly used for injury research surveillance
  - Often difficult to get denominator data
- Self-employed not covered
- Suffers considerable underreporting especially for
  - Musculoskeletal
  - Other cumulative trauma disorders
- Phone survey of self or doctor defined WR upper extremity pain
  - Just over 10% filed for WC (21% using more rigorous case definition)

So, what about Workers’ Comp insurance? This has been another source that’s been used, historically, to try to understand occupational injuries, and it’s been particularly a major factor in some states such as West Virginia – and Washington State is really a classic example where they have good state-based data and they make a real effort to use it, and use it for both research and surveillance.

But one of the problems with – some of the Worker’s Comp claims and it’s a problem, I know, I was trying to do work on our ---data, it’s often difficult to get good denominator data – and a comparable denominator data as to who’s employed, what the current employment population is. It varies widely from year to year, as we all know, with the recession, and we often have difficulty getting that.

The self-employed are usually not covered – I think maybe in some states might be required, but they’re generally not covered. And we get under-reporting, particularly for musculoskeletal and some of these other disorders. For example, one study of self-reported or doctor-defined upper extremity pain found that just over 10 percent filed for a Worker’s Comp, 21 percent if you were a little bit more severe injury. So there’s a lot of people that don’t file for Worker’s Comp.
And there’s a very useful study that was done in a province in Canada where they did a big phone survey, and they identified 255 workplace injuries that were clearly work-related injuries that would normally would have been reported – we would have THOUGHT would have been reported to Worker’s Comp. They have a relatively similar system to the U.S. They found that 40 percent of injured workers who are eligible do not file for Worker’s Comp. It was related to severity and it was a lower proportion of lost time cases. But there were still a significant number of lost time cases that didn’t claim. There was no difference in claim rate by the companies with paid sickness plans.

But one of the issues is, it’s often too much of a hassle to file a Worker’s Comp claim. It’s much easier to do it under your general medical policy. You get a laceration at work, you go and get the finger sewn up, and they may not be bothered trying to claim it as Worker’s Comp and just claim it under your regular medical.

So, that’s obviously an area where there are – it’s not – and in fact, for a long time BLS had a sample of the states that had reasonable state-based Worker’s Comp plans to try and get data from the Worker’s Comp plans, and they have actually abandoned this.
### Underreporting by workers’ compensation insurance

- **M/S disease physician diagnosed as WR in MI**
  - Only 25% of 1598 workers filed claim—reasons
    - Injury not serious enough (58%)
    - Expected to miss work by covered sick leave (28%)
    - Medical expenses covered other insurance (36%)
    - Did not think was WR (20%)
  

- **Fatalities**
  - Only 35% filed WC form (Smith in Press)
So, the surveillance challenges – how can we improve the data available on occupational injuries? And I believe that we need to take at community level or population-based. That was really the only way that we were able to get the fatality data on track, was by taking a community or a population-based level, rather than restricting ourselves to the workplace.
Community or population-based non-fatal injury data

- Medical records based
- Hospital discharge data, state or national sample
- State-based emergency dept. data
- National Surveys e.g. NCHS
  - National Hospital Ambulatory Care Survey
  - NIESS Emergency Dept Survey
- Do they include work-relatedness?
  - many do not
  - If so they rely on it being recorded in the medical record

Well, what’s out there, in terms of population or community-bases non-fatal injury data? And this is part of my – my other “hobby horse” is that we should be trying to integrate the occupational injury and the non-occupational injury programs more together.

The records-based hospital discharge data are available at many states, and also a national sample, and a lot of work has been done looking at injury hospitalizations – and there, they don’t consider whether they’re work or non-work because they can’t tell; but most of the work has been done by the people looking at – thinking about it more as sort of home or off-the-job injuries.

There are also a number of states that capture the data from the emergency departments. And there are some national surveys that also collect some data (population-based) and the big issue that always comes up – do they include work-relatedness? And as I started digging into them, we found that many of them do not.
The National Hospital Ambulatory Medical Care Survey, which is a sample of outpatient and emergency room visits – it has data on cause of injury now, and they do record work-relatedness, but it’s reliant on it being recorded in the chart. This is the whole problem – that these systems do rely on whether it’s reported in the chart. There have been a number of articles looking at work-related injury visits with this. Still – and no one’s really been able to evaluate, how well are the physician’s reporting work-relatedness in the chart.
There has also been a national system for many years, put out by the Consumer Product Safety Commission, which was set up to track product-related injuries. It was a very good nationally representative sample of emergency rooms, and for years the injury community was saying, if only we could use this system to collect this data on all injuries.

Relatively recently, the Centers for Disease Control and NIOSH have been collaborating and funding this to actually collect information on all injuries. And NIOSH has done quite a lot of work over the years, trying to use it to collect work-related injuries as well, and has been doing some very interesting follow-up surveys. So there is a variety of things that have been published on that. And this is based on this whole premise, too, also – we take a population-based approach rather than relying on workplace.
But the Emergency Department (ED) data are not representative of all injuries – it excludes those going to private physician office visits. And they’ve also actually done some studies on hospitalizations that get admitted through the emergency room. But not all injury admissions get admitted through the emergency room – particularly in some of the trauma centers, they bypass the emergency room.

And also for more elective procedures, if you’ve got a broken foot and you seen an orthopedic surgeon in private practice, he’ll admit you directly without messing around by putting you through the emergency room. And it also relies on this documentation in the chart.
Now we come to what I think is a major sticking point – hospitalized injuries. They’re well-defined by the severity of injury, they’re much less likely to suffer a reporting problem in terms of it’s a fairly circumscribed definition. But we don’t have any data in the national data sources. It’s a variable in most hospital data, expected source payment Worker’s Comp. There’s been a bit of work done, now, to try and evaluate how well this might be as a report. But then we talked earlier about the problem of Worker’s Comp and how many are going to be claiming through Worker’s Comp. I’m a very strong advocate for this injury at work variable in the hospital data, the same as we’ve had on the mortality data. And I mentioned the problems with the NIESS ED Occupational sample.
So, this led me to getting involved in – many years ago, before I really started doing a lot of work in occupational injuries, we got interested – saying the National Health Interview had lousy data on injuries. It had very poor information. And a number of us were on committees – the questions – it’s one of these things that takes years and years to happen.

As a result of it, they dramatically improved the survey, beginning in 1997 – and collecting a lot of data on injuries. A lot of good data on injury causes – because the problem with many of these surveys is, they record “did you have an injury?” but we didn’t know anything about the cause. And that’s the major issue that, as public health people, we’re really interested in. And the injury researchers were instrumental in developing the questions.
Got good data on the circumstances of injuries, and it includes all people injured at work – and the important thing is here, you ask about the injury, and then you determine whether it occurred at work. They interview 43,000 households a year. There’s 106,000 people annually, and there’s a greater than 90 percent response rate.
And they use a three-months recall to increase the sample size. The old survey had a two-week recall. As you can imagine, you don’t get a lot of injuries to analyze each year in these surveys.
These are computer-assisted personal interviews – so they actually turn up to the household and sample it – it’s run by the Department of Census with a laptop – and now you’re able to – if you give – let’s say you said it was a fall, up pops a screen with a whole bunch of very specific fall questions on it. They enumerate all members of the household, and the definition is “medically attended injuries and poisons” – and it’s always – you have to think, what is the definition? And it’s “medically attended” – and so it suffers from some of the problems of ‘do you or do you not get medical attention.’

But the problem with them – if you took off days work – I could chop my finger off and be back at work the next day, or even that same day, whereas if my work involved climbing ladders and scaffolding and things, I might be off for two or three months. And so it varies much. And so this was an attempt to try and say, did they need – whereas, both of us – both the two groups – would probably get medical attention if we got our finger chopped off. And they use the three-month recall period.
They have a family call where the adult member responds for all members of the household, and then there’s also a sample adult that collects a lot more information on occupation and industry. One of the problems we have with the survey is that it reduces the sample size down. There’s a sample adult that they interview and they get a lot more information, but it also has data on hours worked, which is something that we’re just about to do some analysis.

So we took a look at the 18 to 64 years – the working age population.
The questions like, “What were you doing when you were injured?” And they would have up to two options, so that you could still be driving a car or doing sports and still be working. And so that was the way we captured people.
Then, for the employed population, we asked them, “What were you doing last week?” And it was: working at a paid job, with a job or business but not at work, looking for work, or not looking for – not at work or job or business. So what we also have is, we have good denominator data, and that’s the whole problem with things – you’ve got to have numerator data, which is great when we get these things – but we also want to have exposure data, and you want – the basic thing is – and we also have hours worked, and…

All things being equal, if you work longer work hours, you’re going to have more injuries. Independent of the fact that, maybe, you might be tired and have more injuries, but it just – the more hours you work, the more exposure you get, the more likely you are to get injured.
And the rates, as I mentioned, come directly from the sample.
So now, I'm just going to go over the results. One of the interesting things – and this – was that 28.6 percent (almost 29 percent) of all the injury episodes to the working age adults occurred at work. That's all very well, but you also have to look at, if you're not employed, then you're not really at risk of getting a work-related injury. And so when you restrict it to the work-related injuries, we find that almost 38 percent of all of the employed adults’ injuries occur at work.

And whenever I present this, people say – and if you look at where most of the injury prevention – there's sort of the -- occupational injury is really the 'black sheep' – the rather neglected part of the whole group. Certainly if you look at fatality data, it isn't – things like motor car crashes – off the job – are much more important factors. But looking at non-fatal injuries – and in some groups, almost 50 percent in males 45 to 64 – all of their injuries that result in medical attention occurring on the job.
So this is just looking at the rates – we counted 4.5 per 100 per year – so of all workers in the U.S. – 5 out of 100 are getting medical treatment for an injury. And it's higher in males than it is in females, as you might expect.
This is looking at the rates by age and gender. You can see, here’s the competence intervals. And the interesting this is that the rates in males are highest in the youngest age group – which is what we all know – and then go down; but the interesting thing is that the rates in females are remarkably similar. The blue one is all injuries, and these are work-related injuries. So you can see what proportion of them are work-related.
So this is looking at the distribution of the causes of injuries between work and non-work, and if you look at all falls, for example, falls are a major problem both on the job and off the job. Over-exertion injuries, which is back strains, are much more likely to occur at work than off the job. Being ‘struck by’ (another category of injury causation) is relatively similar.

Now the interesting thing is motor vehicles, which is this one here – is that motor vehicles are relatively – they’re an important cause of work-related injury fatalities, and approximately 25 to 30 percent of all of the work fatalities are motor vehicle injuries – but as a cause of non-fatal injuries, the off-the-job or the non-work injuries are much more important. And cutting and piercing and machinery injuries, as you might expect, are more likely to occur on the job.
And then, this is just breaking down in more detail on the falls, and one of the interesting things – on the falls, they actually go into these branching questions, so we have more detail. And as you can see, stairs and steps are more important off the job than on the job.

Ladders are a larger proportion of on the job than off the job. But it’s interesting – even though that may be the case, ladders – almost equal numbers of at work and not at work – ladder-related injuries. So ladders are still a major problem off the job in terms of medical treated injuries.
So, falls are the first or second leading cause of on- and off-the-job injuries, and the relative importance varies, as we were just showing you there. The falls on the same level – 47 percent on the job and 47 percent off the job. Stairs and steps I mentioned, and ladder and scaffolding injuries.
So if we then just take this cause data and look at what percentage of all of the causes in these groups are actually work-related injuries, and 75 percent of the machinery injuries are work-related, 47 percent of the fire and burns, and you can go down – and this is the list– and the assault – 17 percent of the assaults that are reported are work-related. I know – (Professor) Sue Gerberich – she is doing a study of assaults amongst teachers, and obviously work-related assault is a major problem and a major policy issue – but only 17 percent of all of the assaults are work-related, and many of them are occurring off the job, and overall it’s 29 percent, as I mentioned earlier.
So now, I decided – and this is a new slide I just put together – where we look at comparing the causes of work injuries between fatal and non-fatal injuries. Because, are fatal injuries the same things as non-fatal injuries? And one of the – I don’t believe they are, and it’s shown very well here.

Over-exertion injuries are 27 percent of all of the non-fatal injuries at work, but basically, almost no one dies from over-exertion injuries at work. And the only reason you really die from an over-exertion injury is if you have back surgery and die of a complication – in hospital, from complication – and that’s probably the only way you’re going to die of a back injury, or an overdose of pain killing medication, or some of those things – but basically, it’s a non-issue.

Falls – they’re more important as cause of non-fatal injuries compared to fatal injuries.
And then you come down to the other extreme where you look at assault. Assault is much more important as a cause of work-related deaths than it is of non-fatal injuries, and that’s why there has been a lot of attention. The leading cause of death in women is still homicide at work. It’s all to do with the lethality of the weapon.

And the same thing with electrocution – with electrocution you have a high probability of dying if you get electrocuted, and there’s relatively not a lot of non-fatal injuries coming from that.

So I put this up to really illustrate to you that, really, when we start thinking about even prevention programs, we’re maybe talking of very different causes between fatal and non-fatal injuries, and it really emphasizes why we need to have good data on non-fatal injuries if we’re starting to talk about prevention programs for non-fatal injuries.
This is the nature of injury – it was actually remarkably similar between them – I already went through that.
The place of injury was interesting, when we’re looking at that. And the interesting thing is that there are still – 4 percent of the injuries in the home were actually occurring while people were working. And I think this is part of the thing – we’re not talking just about traditional workplaces, and this is one of the things that Sue and I have been pushing in the occupational injury program – that traditional sort of safety approach be adjusted to the workplace. Many people are working in a whole variety of different workplaces.
It’s illustrated probably better with this slide, where you look here – that basically, 3.5 percent of the work-related injuries occur in someone’s home, 10 percent occur on the street or highway – sort of, across the board, they’re occurring in a whole variety – and obviously, the proportion in a trade or service or industrial area are much higher work related, but even in those places, there are people getting non-work-related injuries. It’s part of this idea, that there’s a lot of overlap.
So the strengths of the new Health Interview Survey – it clearly identifies injuries at work, covers the entire workforce. It also has some good data on narrative text, and good data on causes.
Limitations

- Self report of work-relatedness
- 3 months recall
  - Trade off recall bias vs. larger sample size
  - 480-490 work injuries/yr
- Medically treated injuries only
  - Difficult to compare with BLS

The limitation is really – still relies on self-report and recall issues and small sample size – we really only have about 500 injuries a year in our samples – so that when you adjust them up to the national estimates you get wide confidence intervals. And it’s sometimes difficult to compare with the BLS. We did a small effort, and I’ll show you later.
So the conclusion of this part is that injuries to working age adults are common. The work-related injuries are a significant part of the injury burden to working-age adults, where in some groups up to 49 percent are work related. And this is really the first time in the U.S. we’ve had comparable data for work and non-work injuries, where we use the same definition, using the same methods, and then determine their work-relatedness.
We did a comparison with the Health Interview Survey data with the Bureau of Labor Statistics data, and as you might expect, 22 percent of the people injured were – when you looked at their – we asked information about their employers, and 22 percent were in occupational industry groups not covered by the BLS survey. The closest we can get to exact comparison of injury severity was lost work day injuries, and our count was 1.8 time higher than the BLS, which is similar to some of the other studies that have been done trying to validate it.

And even if you looked at private industry, which is the group that should be covered by the BLS, our counts were 1.4 times higher – which we believe clearly demonstrates the need for population-based surveillance.
Surveillance Challenges

- How can we improve the data available on occupational injuries?
- Workplace-based systems do not provide comprehensive picture of all workplace injuries
  - Increasing proportion workforce excluded
- Biases in the capture (e.g. severity, reporting)
  - Different definitions BLS/OSHA vs. medical treatment
- Do not assess all injuries from a specific cause in the population for work-relatedness

So what are our surveillance challenges, and how can we improve our data on occupational injuries? Clearly in my mind, the workplace-based systems do not provide the comprehensive picture of all workplace injuries, and there are increasing concerns that more and more of the workforce is excluded, as people become independent contractors. There are the biases in capture as we’ve talked about earlier, and we need to assess all injuries for work relatedness.
Need for community level or population-based data
  – industry/workplace-based data misses many groups

Mortality data are now population-based

So I believe we should be taking a community approach to surveillance for work-related injuries. The mortality data are now population-based, and we’ve made some significant improvements there, and we need to be thinking about how to do this for non-fatal injuries.
My recommendation is that all — work-relatedness should be in all health injury databases. Ideally it would be nice if we had occupation industry as well.

The priority, in my mind, is to capture work-related hospitalizations as a major issue. And we should use the available health data sources. There’s a lot of money and resources being spent at various levels collecting hospital discharge data, collecting emergency room data, and just by simply adding this "Work? Yes/No" variable on it, we can greatly improve the quality of the data, and also, we can encourage better documentation in the chart.
Similarities Between On and Off the Job Injuries

- Causes very similar
  - Tasks often identical or at least similar
- Rankings change little between on and off job
  - Motor vehicle
    - More likely off the job
  - Overexertion, machinery, foreign body
    - More likely on the job
- Falls or overexertion are leading causes on and off the job

Injuries on and off the job – one of the other things is that the theme of this talk is this idea of blurring the distinction of home and work injuries. We’ve actually written a couple of articles on this concept, more as a conceptual piece, and now we have some data to back up these things. Our argument is that exposures may be similar, but comparable data had not been available. We talked about the data systems not being comparable. And we’d proposed earlier, in some earlier work, that a separation between home and work may not always be in the best interests of prevention.
I'll give you some examples of this. When you’re looking at – from the Health Interview Survey – the causes were relatively very similar – in some broad groups – between them. Many people are doing similar tasks at work and off the job. For example, motor vehicle injuries – while they’re not a major proportion of the work-related injuries, and they’re much more likely off the job, many of the prevention strategies, to prevent work-related motor vehicle injuries, are going to be very similar to preventing them off the job. Falls, for example, we’ve talked about as a major issue.
And this is best illustrated – I was asked by someone to take a look at farm injuries – there’s a real problem – when is it a work-related injury? And I know Sue’s done a lot of work with their farm injury surveillance programs.

And now taking a look at our data, only 33 percent of the adult injuries that occurred on farms – where the place was marked as a farm – were reported by the respondent as working for pay. So, we may have some problems in undercount of our work-related injuries, because people don’t – you know, in terms of, what is working for pay, particularly on a farm. Some of the farmers have every right to consider themselves as hardly being paid for their work, in terms of some of the issues involved there. And also, if you’re a part-time farmer, do you think of yourself ...(as a farmer)? So we have to be thinking that our system might be under-counting those.

And I think the farming community has really taken this bull by the horn in terms of saying, we should just take a community approach to prevention. OSHA specifically excludes farms from their jurisdiction, from counting them and from getting involved in prevention. I think that we can learn from some of these programs, in terms of how to prevent injuries to that group of the workforce that aren’t covered well.
So as part of this community approaches to prevention – and then I’m just going to finish up with this theme – that the nature of work is changing. Many workers are not covered by the traditional workplace-based prevention efforts. There was a very interesting National Academy of Sciences report that came out on this – titled “The Changing Nature of Work.” – and clearly described the changing demographics of the workforce, the changing type of work that people are doing.

Clearly, we’re going to have a larger proportion of our workforce that are not covered by our traditional workplace-based programs, and we have to be broadening our approach, and that’s where I really think – the state health department, which has a mandate to prevent injuries and disease in the community – and more and more state health departments are developing occupational programs. I was pleased to see they have a good program here in Minnesota, and they have a good program in Massachusetts. I’m actually on their advisory board. Davis runs that program. And I think, to me, this is on the right track. One of the big programs have been teens and – teens in terms of work-injury problems. And that’s clearly an issue where, we’re addressing it as a community issue, not as a workplace – obviously they’re targeting workplaces where teens work, but it’s part of a broader effort, and much more of a public health approach.
Many of the risks are similar, and I’ve covered much of this thing in my – the teen injury, and the farm injury I think are good models that we can take to learn, to give to the general injury prevention community. And also, we should be trying to get the general injury prevention community to get interested in considering workplace, because it’s a significant proportion of the sort of general injuries that they get interested in.
Now I want to just examine, why should employers be concerned about off-the-job injuries? One of the problems with any injury prevention program is who’s going to pay for it? It’s a very expensive proposition to fund injury prevention. And we really haven’t been very successful getting state dollars, getting federal dollars directed to injury prevention. Most of us in the room, involved with injury prevention, would think it’s been greatly under-funded in relationship to the magnitude of the problem.

Well, off-the-job injuries are a significant cause of absenteeism in the workplace, be it with either the worker is injured, or also to care for family members. The other big pinch in my mind, is that the health care costs are usually paid through work-place-based health insurance. If it’s on the job, it’s paid by Worker’s Comp on the job. But if it’s off the job, a significant proportion of those costs are paid directly by the workforce. So it’s actually just – purely from a ‘who is paying for the injury?’ perspective, it’s a major issue.
And this is some interesting work that the National Safety Council has done with some estimates, to try and get at this idea of the importance of off the job. If you look at where people die, only 5 percent of the deaths are believed to be occurring – of all of the deaths – are work-related injury deaths. And this is why I think deaths are very separate, and we shouldn’t be fixated on the mortality data.
To take it from a broader idea, if you look at all unintentional injury deaths, 63 percent are workers or their family members. In other words, if the deaths were representing medical costs or who was treating it – and while we – obviously, there are differences between deaths and non-fatal injuries – 63 percent of the people that are killed from non-intentional injuries – potentially their medical costs and the issues involved in treating them before they die are probably covered by workplace-based systems.

And so, this is sort of the first evidence that I’ve got – and part of our analysis we’re planning to do is to go in and look at the issue of what is the cost and the impact on the workplace of injuries to workers, and then later on to even look at the impact of non-fatal injuries to the family.
So another reason why employers should be interested in off-the-job injuries is that the workplace is theoretically an ideal place, in my mind, to do interventions. It’s a model for evaluating community interventions because potentially, the same people that are going to be paying for the prevention are going to be potentially representing the benefits of this, and also, it's a more controlled environment upon which to either deliver health promotion messages, to look at other issues such as encouraging workers to buy cars with side air bags, and these kinds of issues.
There is a whole variety of issues that we could take in terms of encouraging people to buy safer cars and, in terms of looking at the importance, for example, of motor vehicle injuries, even just seat belt usage. There have been some interesting programs to encourage seat belt use on the job, and actually spill over off the job. Often the prevention strategies – I was starting to mention – are similar, and seat belt use promotion – and there have been – and it’s still a problem, it’s interesting.

Sue Baker at the NIOSH occupational injury meeting last year presented some very interesting stuff about the proportion of truckers that get killed or injured in truck crashes that are wearing their seat belt. And we’re only talking of about 20 percent of the truckers that are driving these big trucks – are wearing seat belts.
And so we still have some major issues in terms of thinking about preventing injuries in the workplace, and I’m sure – what are those people doing when they go off, there? Are they not wearing their seat belt when they’re driving their truck and then wearing it when they get home? Because if you look off the job, when they do these seat belt surveys in cars, we’re talking – we’re supposed to be up to around 80 percent seat belt usage in this country. But there’s still a 20 percent that aren’t wearing seat belts, and they’re at the highest risk group. They’re the people that are drinking, the young people, teenagers, people driving at night – those kinds of issues. So, are there some lessons we can take from that?

Falls, for example, is another area where I think we could be thinking about these strategies. Can we design better ladders, for example, that reduces injuries? And if we design better ladders, more stable ladders, wider ladders, various other options, it would also reduce injuries at home and work – although I do know that the ladders we have at work are far better than the rickety old wooden ladder that I have hanging on the side of my garage, and so obviously, there’s more problems in terms of thinking about some of those issues.
Smoke-free workplaces cut smoking

- protect non-smokers from the dangers of passive smoking
- encourage smokers to quit

Fichtenberg BMJ. 2002;325:188

The best example that I could find, when I was looking for some really effective things, is the smoke-free workplaces as an effort to cut smoking. It protects – and there was a big meta-analysis down in the BMJ (British Medical Journal) relatively recently, of these programs – and it clearly protects non-smokers from the dangers of passive smoking. But also, it was found to be a major issue in terms of encouraging smokers to quit. There have been a number of studies that have shown that.

So, here by a workplace-, worksite-based control – and we’re not only talking about just health promotion, saying, “Okay, don’t smoke” – we’re talking about environmental controls, we’re talking about not smoking in the workplace – forcing people to go out and stand in the snow if they want to smoke rather than – and all these things have shown to reduce the smoking. So can we think about – and I'll be interested to get some comments from people – applying these approaches for work-related injuries and non-work injuries.
Conclusion

- Injuries at work are an important part of the injury burden among adults
  - 29% of all adult injury episodes at work
  - 38% among employed persons
- Need to develop community-based approaches to injury surveillance and prevention
  - Traditional systems underreport
- On and off the job injuries all result in significant costs to employers
  - May be an opportunity for injury prevention
- New Coordinating Center for Environmental Health, Injury Prevention, and Occupational Health at CDC
  - May facilitate integration on and off the job prevention

So, just to summarize and pull it all together, injuries at work are an important part of the injury burden among adults, and we need to be thinking about developing community based approaches, both to injury surveillance and prevention for both on the job and off the job injuries.

On- and off-the-job injuries all result in significant cost to employers, and I think it may be a very interesting opportunity for injury prevention we should be exploring. One of the barriers is prevention approaches. The agencies responsible for regulation and prevention are very different.

For example, you’d have OSHA involved in regulations, which is a whole separate, even federal agency – to the Senate’s Injury Prevention and Control Program. It’s very interesting – there’s a – and Marilyn Fingerhut, last night, talked about the steps for a healthier workforce, a big new initiative that NIOSH is launching, and I think we should be expanding this to be thinking of the healthier workforce and the impact of injuries both on and off the job.
Some interesting developments over the last few weeks, really; I noticed that CDC has created another layer of bureaucracy and they’ve set up a new Coordinating Center for Environmental Health, Injury Prevention, and Occupational Health – what a mouthful! They can’t come up with a simple name for it. And the only – one of the potentially positive advantages is that maybe it might encourage better integration of on- and off-the-job injuries.

Certainly the experiences that Sue and I have had with CDC over the years in terms of the NIOSH injury prevention and the mainstream injury prevention – sort of which is officially all injuries, but actually is off-the-job excluded. Sometimes at the last minute, they think of it – ‘oh, we should be thinking about on-the-job injuries, also’ – so they occasionally invite NIOSH to participate.

But this may have some – it’s obviously going to have some problems – and discussing with people now is that NIOSH is sort of further down in the administrative structure and maybe the danger is that even the funding for occupational health and safety is going to go down. Still, despite the magnitude of work-related injuries as part of the occupational health problem, injuries are still not a large part of the NIOSH budget, and we would like to see it a larger part of the NIOSH – both intramural and extramural – budget.


Article on new work submitted.
So thank you very much, and I'll be happy – good, I've left some time now so we can take a few questions and comments and some feedback from people.
Question:  
(James Koskan, Corporate Director, Risk Control, SuperValu Inc.)
I just wanted to clarify some of the data. I believe you said there was a rate of 4.5 injury rate for workers on the job, based on the survey results. And, did I see a number of – 12 was the rate for all the general population, including everybody?  

Answer:  
I think that would be about right, but I can get back to you on the exact number on that.  

Question, continued:  
Okay. Given that, I guess my question is, if you were going to look at the total costs of this problem of accidents, in it’s entirety – a piece of it is what can be affected by work-related control measures, and a piece of it is what can be controlled by non-work-related risk factors – how would you break that cost down? What percentage of it do you think can be controlled within the work environment versus non-work environment?
Question & Answer

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Questioner: James Koskan, Corporate Director, Risk Control, SuperValu Inc.)

Answer:
Ah, the simplest thing to say is what proportion of the injuries? Then do we look at all injuries and to all ages, or do we just look at the working age population? And I think that’s a – because if we dilute it down, and add in what percentage of work-related injuries are they of all injuries in the community, then it gets even less as part of the problem. But I think the issues involved – and for example, childhood injury prevention – are sort of a very different issue to thinking about what might be involved in adult injury prevention.

The other issue is that we have a much higher mandate in terms of providing a safe working environment, a safe workplace, for people, and that the workplace people also have a financial interest in it. So if you were saying, okay, we’ll just use federal dollars for it, there might be some argument to do it just in proportion – and what proportion of the problem is occurring in the workplace?
But I think that we should be thinking of how can we combine our forces to try and get more value for our dollar, and I guess it’s hard to put an exact – that’s also what you’re trying to push for – is that, how do you come up with a figure of what proportion should be done in the workplace?

Certainly, if you look at the amount of money being spent on occupational health in general, we feel that workplace injury prevention really – despite increased attention in recent years – still is not getting its fair share of the workplace prevention efforts.
Question & Answer

Question: “Gordon, thank you for a very nice presentation and challenging us to think about the data. I have two questions. The first one is, what is the role of national and state government in injury prevention? What should be the primary functions of government? And secondly, if you were to have a blank sheet of paper and design a surveillance system for, say, a developing country for work-related injuries, what would be the essential elements of that?”

Questioner: Dr. Ian Greaves, Associate Professor, University of Minnesota, School of Public Health

Answer:
I guess, in terms of the role of government, I think we’re seeing more and more that health departments are taking on the role of injury prevention in the community for looking at – and under their mandate, they’re theoretically talking of all injuries, but they’re sort of generally talking of non-workplace-related injuries, when push comes to shove.

And then separately, you have – often in quite a very separate part of the health department the group talking about occupational health problems. I had a very interesting conversation with Marilyn Fingerhut, and that’s been very much the same situation that – in World Health Organization (WHO).
I did a search about six months ago at the WHO injury prevention website. There’s been a huge effort of injury prevention, a big expansion of WHO. I couldn’t find a single – I searched every page in the website for the word “occupation” – not a single mention in the website of WHO – injury prevention. And it’s particularly relevant to your question on the developing countries, because they are very much involved in developing countries.

And even if you look at the big World Health Report that’s just come out on motor vehicle injuries – it’s a big thick document, about that thick – there’s a little section, I actually – I have to get my ruler out so I can actually give you some numbers to measure – but it’s basically about that long, talking about occupational motor vehicle injuries. And yet the fact – in the U.S. it’s 25 percent of all of our occupational deaths occurring in motor vehicles.

So, what I would like to see is closer integration. I think, obviously, there’s different funding and different – there’s much more regulation in the workforce, and much more, sort of, encouragement in the non-workforce in terms of prevention strategies, but I think there are a lot of overlap and a lot of commonalities, and I think the two groups could learn from one another. And I guess – I’m not proposing that they should all be the same, but I think we should be trying to learn and better dialogue between the two taking more advantage of resources.
Question & Answer

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And with regard to developing countries, even more so; I mentioned the issue of farming – when is it work and when is it not work? It’s even more important when you’re talking of subsistence farming and issues like that.

So I think we should be talking – and I had a long talk with Marilyn Fingerhut about trying to get – WHO occupational health program is starting to get interested in injuries, and Geri Fleishman, who has replaced Marilyn at WHO, took my injury epidemiology course when I was at Hopkins, and she’s got the injury bug – and so now I’m sending an email off to her this afternoon, to say Geri, let’s get together sometime if you’re in the U.S. and think about this issue of how we can blend the workplace and the non-workplace, and take the initiatives in the occupational health.

Because I think that’s what we should be doing. We should be trying to identify the sub-sets of the work-related injuries out of that, because there are community efforts ongoing. I was just going over some stuff from Viet Nam. There’s been a number of big surveys done in injury prevention in the community, household surveys, hospital surveys – but for everything I can read, they didn’t even ask the basic question – did it occur while working or not working, or working for pay? We ended up with a … definition, but we can’t distinguish. And it’s one simple question. And I guess my bottom-line question to the general injury community is ask about work, because it’s an important exposure. And some groups and some of the things, we have better regulatory measures to try and deal with that group.
Question: “I think I’m next. I would like to bring some of this information to my employer, because I think it’s really, really important. Where would be a good website to get some of the graphics that you had and the numbers you had?”

Answer:
We're working on a paper at the moment we're trying to get published. I'd be happy to give you some of the basic numbers. I think there’s very good examples – the NHTSA has – part of their website – some good things of what can employers do about motor vehicle injury prevention, and they’re actually leading the fray in that area: National Highway Traffic Safety Administration. And if you come to me afterwards, I’ll be happy to get your email and try and see if I can plug you into some of those things.
Question: “Gordon, I would just like to make a quick comment with regard to the various surveillance systems, and certainly many of us are aware that hospital-based surveillance has been kind of a pervasive thing for many years; and often, people rely on that rather than considering some of the other options that you discussed. I just wanted to comment that – based on some surveillance that we’ve been doing for many, many years, particularly in the rural community – if you used only hospital-based surveillance, you would only pick up 5 to 6 percent of the total cases, yet over 90 percent actually receive health care, and a large proportion of these are actually pretty significant injuries. So I think we just have to keep that in mind, that obviously, it’s a trade-off between cost and benefit, but I think it’s really important to know that you’re going to miss a huge proportion of important injuries.”

Questioner: Professor Susan Gerberich, Professor, School of Public Health, University of Minnesota
Question & Answer

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Questioner: Professor Susan Gerberich, Professor, School of Public Health, University of Minnesota

Answer:
I think that’s a very good point. And if you look at our Health Interview Survey data, only about, I think, 8 percent of these injuries are going to be hospitalized. And so, I think the vast bulk – the reason I was concentrating on the hospitalizations is because they are the most serious, and I think it’s an issue in terms of surveillance of work-relatedness. But I think you’re right, we do need to work across the spectrum.

But also, as part of encouraging people, even in terms of medical – physicians involved for emergency departments, for example – to consider the work-relatedness of a particular injury, because maybe there’s some – if someone’s getting their fingers jammed – there may be some open – people working in workplaces that don’t have adequate machine guarding – it may be easier to do some prevention, from identifying a work-related injury, than it may be in terms of the home-community injuries.

Response:
Exactly. Okay, I think we need to wrap it up, there. It’s time for a break, and then on to