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Injuries related to wind speed

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This is a retrospective study of the injuries caused by high wind speeds during the storms of early 1990. Injured patients seen on windy days were compared with those seen on a group of control days. It was found that high wind speeds were associated with an increased risk of injury, especially when wind gusts exceeded 60 knots. This apparent wind speed threshold, above which injury is more likely, corresponds to the curve used by the Meteorological Office to predict wind-related structural damage. It is postulated that this finding may be of use in assisting the Government in formulating its guidelines on when to warn the public that it is unsafe to venture out.

In early 1990 Great Britain was battered by fierce storms. Although the damage was not as great as that which followed the 'Great Storm' of October 1987, there were 49 reported fatalities and insurance claims amounting to £150 million in respect of wind-related structural damage (Association of British Insurers).

It has already been recorded that high wind speeds are associated with increased risk of injury (*1*). Our study quantifies these speeds and describes a threshold speed above which personal injury is much more likely to occur. We have detailed the injuries sustained by patients presenting to two inner city London accident and emergency departments, which together see a total of 72 000 new patients/year.

Methods and results

In January and February 1990 there were 10 days when wind gusts of over 45 knots were recorded in London. For the purposes of this study, these 24-h periods were regarded as 'windy days'. The 45 knot cut-off point was chosen because it is this wind gust speed that most major insurance companies use as a guideline when considering claims for wind-related structural damage (Association of British Insurers). Ten control days, on which the wind speed did not exceed 45 knots, were chosen from the same period. Each of these control days was, wherever possible, paired with a windy day exactly 7 days later. The only exceptions to this rule occurred when 2 windy days fell exactly 1 week apart. In these instances a control day was chosen either 6 or 8 days before its paired windy day. A week-day was always matched with a week-day and a week-end day with a week-end day. We examined the case notes of all patients seen in the two departments on both the windy and the control days retrospectively. The total number of patients seen on each day, the number of wind-related injuries and their nature were recorded and a comparison made between the two groups.

Table I shows that the total number of patients seen in the two accident and emergency departments was not significantly affected by the wind speeds. However, the number of patients with wind-related injuries was significantly increased on the 10 windy days compared with control days (Mann–Whitney U test $=78$, $P<0.05$). It was only on the 2 days when wind speeds exceeded approximately 60 knots that the number of wind-related injuries became large (Fig. 1).

Over the entire study period 58 patients with wind-related injuries were seen, of whom eight required admission to hospital. The types of injury and the anatomical distribution are shown in Table II. Fifty-eight patients sustained a total of 70 injuries as some patients suffered more than one injury; 32 were female and 26 were male. The age group distribution is shown on Fig. 2. Four wind-related injuries were seen on control days and these were all young men who had had dust blown into their eyes.

The majority of patients were either hit by flying debris or falling masonry (36%) or were blown over by

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Table I.

	Windy days									
Date 1990	*Tues 23.1*	*Thur 25.1*	*Tues 30.1*	*Thur 1.2*	*Wed 7.2*	*Thur 8.2*	*Sun 11.2*	*Mon 12.2*	*Wed 21.2*	*Mon 26.2*
Number of patients	178	177	170	171	164	186	165	198	166	200
							(Mean 177.5, SD 13.2)			
Wind-related injuries	1	36	1	0	0	1	2	1	2	10
									(Median 1)	
Wind gust speeds (knots)	47	75	57	52	56	59	51	50	46	64

	Control days									
Date 1990	*Tues 16.1*	*Thur 18.1*	*Mon 22.1*	*Fri 26.1*	*Wed 31.1*	*Fri 2.2*	*Sun 4.2*	*Mon 5.2*	*Wed 14.2*	*Mon 19.2*
Number of patients	181	170	199	169	171	164	139	181	170	216
							(Mean 176, SD 20.7)			
Wind-related injuries	1	0	0	0	1	2	0	0	0	0
									(Median 0)	
Wind gust speeds (knots)	36	22	34	33	42	38	44	31	39	40

(Conversion factor knots into miles/hour = 1.15)

the wind (33%). Four people sustained injuries as doors were blown shut onto them. The vast majority of the injuries were sustained during daylight hours.

All the injuries were sustained in separate incidents with the exception of three people who were among the most seriously injured. They were in a building which collapsed and included a 2-month-old boy who sustained a fractured femur, a 32-year-old woman with a compound skull fracture and a 40-year-old woman with fractures of her 1st and 2nd ribs, a fractured scapula and a fractured fibula. A 31-year-old man fractured the laminae of his 5th and 6th cervical vertebrae and the spinous process of the 4th cervical vertebra, when scaffolding fell onto the roof of his van.

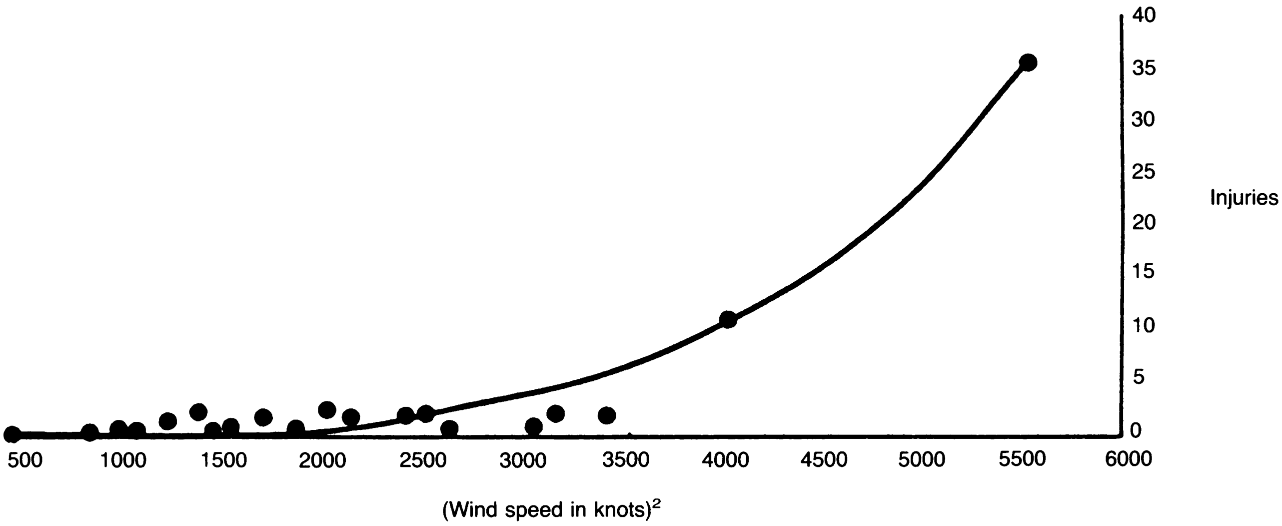

Figure 1.

Table II.

Types of injury		*Anatomical sites of injury*	
Head injuries—no fracture	15	Head	17
Head injuries—compound	2	Eyelid	12
Fractures	18	Lower limb	12
Foreign body in eye	13	Upper limb	9
Lacerations	9	Face	4
Soft tissue injury	8	Chest	4
Abrasion	4	Back	1
Other	1	Neck	1

We saw only one fractured neck of the femur and only one distal radial fracture.

Discussion

It is not the mean wind speed, but the speed of gusts of wind which is important in causing structural damage. During the 'Great Storm' of October 1987, the mean wind speed, in London, was only 22 knots, but gusts of 82 knots were recorded. This compares with 26 February 1990 (one of our study days) on which the mean wind speed was 25.2 knots, making it the windiest day in London for 3 years. Prior to that, the windiest day had been 27 March 1987, when the mean wind speed was 25.7 knots but gusting did not occur, which perhaps explains why it was not remarked upon by the media.

In our study the total number of patients seen on windy days did not differ significantly from the number seen on control days, but there was a significant increase in patients with wind-related injuries. On two of the days the proportion of patients seen with wind-related injuries was dramatically increased. On both of these days the wind gust speeds exceeded 63 knots. The relative decrease in minor injuries, not related to wind, may be due to people's reluctance to venture out in such weather to attend the accident and emergency department.

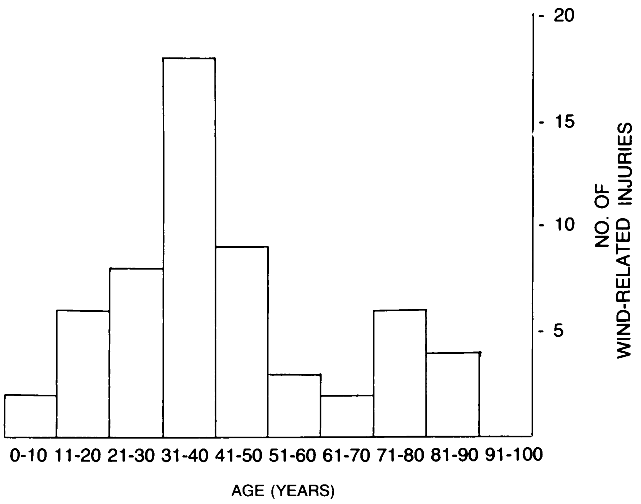

Figure 2.

The number of personal injuries resulting from falling masonry, scaffolding, advertising hoardings and various loose debris was only increased on days when wind gust speeds exceeded 63 knots as demonstrated on Fig. 1. Interestingly, this graph shows a curve similar to that used by the Meteorological Office for predicting structural damage. Structural damage to buildings appeared not to have caused injury at lower wind speeds. This is either because the structures were not damaged in these lighter winds or because any damage that did occur did not cause injury, for instance if the damage happened at night, when fewer people are likely to be vulnerable.

Most of the injuries seen were minor in nature, although some were serious enough to justify warnings to the public that it would be safer to stay at home on certain windy days. Currently there are no firm guidelines for the issuing of such warnings. The results of our study suggest that wind gust speeds in excess of 60 knots represent more of a risk to individual personal safety. Our findings may be of some use to the Meteorological office in formulating a policy as to when these warnings should be issued.

Conclusion

The Meteorological Office states that damage is proportional to (wind speed)^2, with the association becoming very much more pronounced above a certain wind speed threshold. Our study shows that injuries follow the same pattern (Fig. 1). There are, however, three complicating factors: the time of maximum gusting; the number of individual incidents (several people could be injured in a single incident); and random events which would have happened whether it was windy or not. These must all be borne in mind when interpreting our results. Our own conclusion is that the risk to individuals in an inner city environment, during daylight hours, is increased on windy days. The apparent threshold above which the risk becomes significant is approximately 60 knots.

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Reference

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