

# **Does the improved stability offered by motorcycle antilock brakes (ABS) make sliding crashes less common? In-depth analysis of fatal crashes involving motorcycles fitted with ABS.**

## **Abstract**

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### **OBJECTIVE:**

This research investigated the following issue. Though several tests indicate that motorcycle ABS may increase motorcycle stability, thus reducing the risk of a sliding crash involving braking (i.e., the rider is separated from the motorcycle and slides along the road surface prior to collision), there is limited research showing to what extent sliding crashes are reduced by ABS in real-life conditions.

### **METHODS:**

The Swedish Transport Administration (STA) and the Norwegian Public Roads Administration (NPRA) carry out in-depth studies for all road fatalities. A total of 38 in-depth studies with ABS motorcycles were included: 22 in Sweden and 16 in Norway (2005-2014). These were compared with 98 cases in Sweden and 32 in Norway involving motorcycles of the same types but without ABS. The data sets were analyzed separately and also merged together. The difference between the proportions of sliding crashes regardless braking was analyzed; selective recruitment was handled with a sensitivity analysis. Induced exposure was used to calculate the reduction of all crashes and those involving braking.

### **RESULTS:**

Four ABS cases (11%) involved falling off the motorcycle prior to collision, and 35% of the non-ABS crashes were sliding ( $P = .004$ ). The sensitivity analysis showed that the results were stable, with a relative difference of sliding crashes ranging between 65 and 78%. None of the 4 sliding crashes with ABS occurred during braking; that is, all ABS riders who braked prior to collision crashed in an upright position. In the 4 sliding cases with ABS, the riders lost control of their motorcycles: 2 while accelerating on asphalt with very poor friction, 1 while negotiating a curve with an excessive lean angle, and 1 by abruptly releasing the throttle in the middle of a curve. Although based on a limited number of cases, the distributions of sliding and upright collisions among crashes without braking were similar, thus suggesting that the crash posture would not be affected by ABS if no braking occurred. The calculations with induced exposure showed that upright crashes with braking were also reduced by ABS; all fatal crashes, regardless of braking, were reduced by 52%.

### **CONCLUSIONS:**

Though this research was based on a limited material, it confirmed that sliding fatal crashes are significantly decreased by ABS. Considering that ABS will soon be mandatory in the European Union on all new motorcycles with engine displacement over 125cc, these findings should be taken into account in the future design and testing of motorcycle-friendly road barriers and integrated protection systems.