

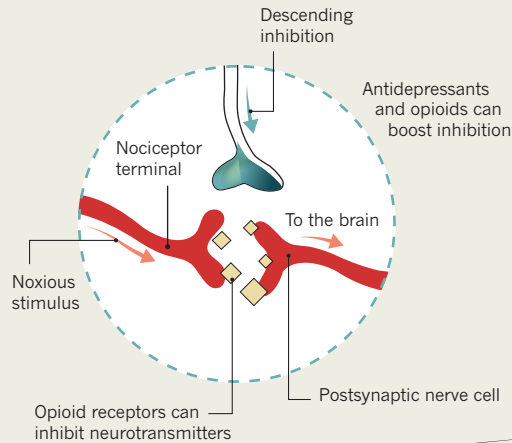
THE PAIN DRAIN

We can't live without it, but many of us struggle to live with it. Pain has an essential biological function, but too much — or the wrong sort — ruins lives and puts a sizeable dent in economic productivity. **By David Holmes, infographic by Mohamed Ashour.**

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FEELING THE PAIN

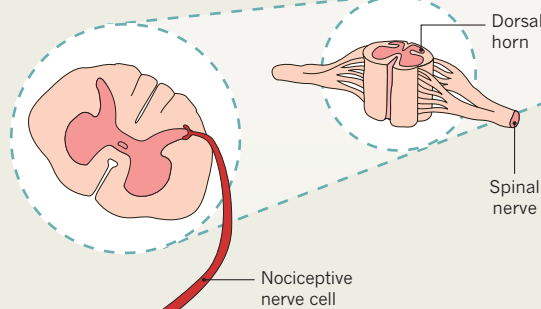
Nociceptive inputs to the dorsal horn are subject to powerful descending control from a network of areas in the brain. Signals combine in the brainstem, then travel down (blue arrows) to alter ascending nociceptive signals. Many painkillers, such as opioids and antidepressants, act at this junction.



2

SIGNAL

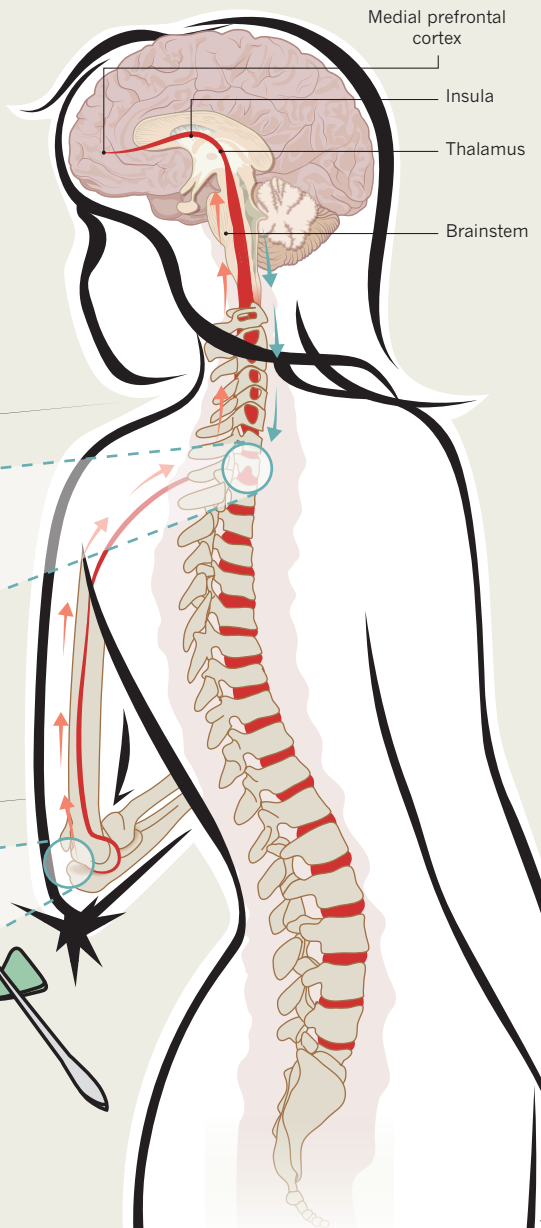
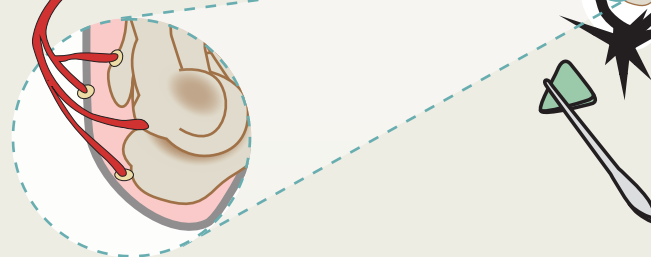
The pain signal is transmitted along axons of nociceptive nerve cells to the dorsal horn of the spinal cord. Signals from the dorsal horn then pass to the brain (red arrows).



1

TRAUMA

Nociceptive pain starts with the stimulation of nociceptors, which are found in the skin, internal organs, muscles, joints, and the membranes around the brain and spinal cord.



NOCICEPTIVE PAIN

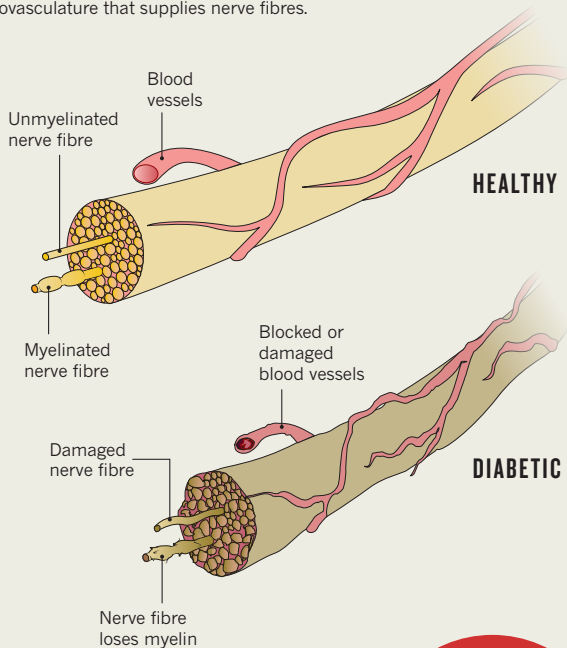
This type of pain is caused by the activation of nociceptors — specialized sensory neurons that are stimulated by noxious mechanical, thermal or chemical stimuli. Nociceptors transform these stimuli into electrical signals and relay them to the central nervous system. Nociceptive pain tends to be short-lived and associated with injury. But if it persists beyond 12 weeks, it becomes chronic pain — and its nature can change.

NEUROPATHIC PAIN

Unlike nociceptive pain, neuropathic pain is caused by damage to the somatosensory nervous system itself, as a result of trauma or disease. However, there is not always a clear link between disease states and neuropathic pain.

DIABETIC NEUROPATHY

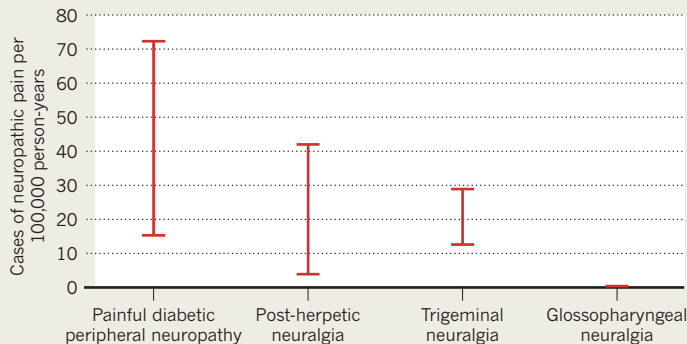
Painful diabetic peripheral neuropathy is one of the most common forms of neuropathic pain, with its incidence set to increase as the obesity and diabetes epidemics continue to grow. Neuropathy is caused by metabolic factors as well as by damage to the microvasculature that supplies nerve fibres.



7-10%
Population prevalence of neuropathic pain¹

NEUROPATHIC PAIN INCIDENCE

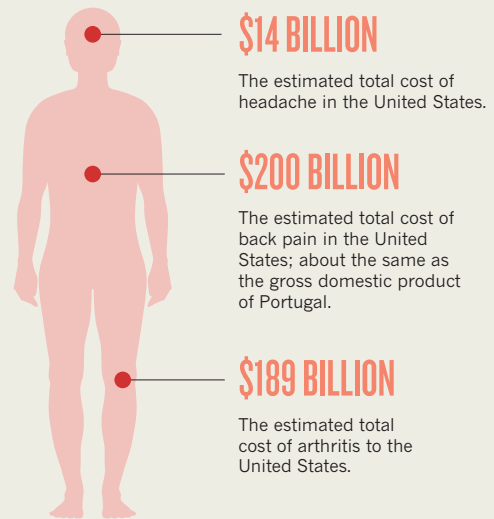
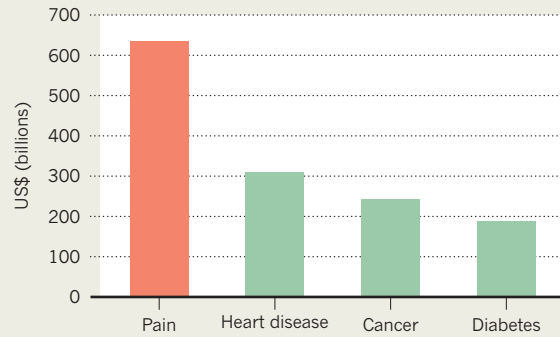
Definitions of neuropathic pain vary across studies, leading researchers to call for a unified nomenclature. The best evidence on incidence comes from studies of neuropathic pain linked to specific conditions, but even then ranges can vary widely¹.



PRICE OF PAIN

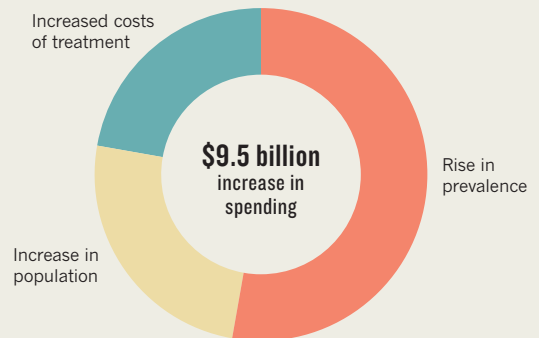
BIGGEST BURDEN

Around 100 million adults in the United States are affected by chronic pain in a single year. The annual total cost of pain, including direct costs, decreased wages and lost productivity, eclipses that of any other condition².



GROWING PAIN

Health-care spending on back problems in the United States more than doubled between 1987 and 2000. Although treatment costs and population increases contributed, most of the \$9.5-billion rise was due to an increase in the prevalence of back pain³.



1. van Hecke, O. et al. *Pain* **155**, 654-662 (2014). 2. Inst. Medicine *Relieving Pain in America* (National Academy of Sciences, 2011). 3. Thorpe, K. E. et al. *Health Affairs* <http://dx.doi.org/10.1377/hlthaff.w4.437> (2004).