Elongation of the vertebrate rostrocaudal (head-to-tail) axis depends on axial progenitors in the primitive streak and tail bud regions. At least some of these progenitors behave as neuromesodermal (NM) stem cells, giving rise to the spinal cord and musculoskeleton of the axis. They are found in the node-streak border and caudal lateral ectoderm at primitive streak stages, and later in the chordoneural hinge of the tail bud. While NM-fated cells in the gastrulation-stage epiblast are pluripotent, they become restricted to NM fates at the start of somitogenesis when pluripotency is lost. Within the NM progenitor region, cells are exquisitely sensitive to their position and differentiate as neurectoderm or mesoderm accordingly, with mesoderm commitment strongly dependent on Wnt/Bcatenin signalling. In contrast, the caudal extremity of the caudal lateral epiblast, which is not fated for neuromesodermal differentiation, shows only mesoderm potential. Wnt signalling is not only required to direct NM progenitors towards mesoderm fates, but also maintains axial progenitors, since mutants lacking Wnt3a have shortened axes. We observe a peak in Wnt signalling in axial progenitors during formation of trunk vertebrae, and a subsequent decline, reaching minimal levels at the end of axis elongation. Our results point to a mechanism that is conserved among vertebrates to continuously regulate the proportions of neural and mesodermal cells produced during axial elongation via dynamic interpretation of position to choose neural and mesodermal fates.