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The Future of "Big Data" in Suicide Behaviors Research: Can We Compare the Experiences of the U.S. and U.K. Armed Forces?

Laura Goodwin, Simon Wessely, and Nicola T. Fear

The recent increased suicide rate in the U.S. military has received widespread academic and media attention (Nock et al., 2013). "Big data" has been defined as large, complex, and linkable information (Khoury & Ioannidis, 2014) that can be used to investigate such changes in incidence at a population level. "Big health data" can revolutionize the future of epidemiological research, and this commentary discusses a specific example of how it can be used to progress suicide research.

The Historical Administrative Data Study (HADS) is part of the Army Study to Assess Risk and Resilience in Service members (Army STARRS) (Ursano et al., 2014). HADS provides a unique and valuable source of data for the U.S. Army to assess the prevalence of suicidal ideation and suicide attempts in Army personnel and to identify risk factors. HADS comprises historical health and administrative records from personnel in active duty between 2004 and 2009 and includes data from more than 38 different Army and Department of Defense (DoD) data systems. This provides coverage on more than 1.6 million soldiers, so the scale is impressive. In line with evidence that suicides are increasing in the U.S. armed forces, now higher than the incidence in civilians (Nock et al., 2013), these data from HADS show that nonfatal suicidal behaviors are also increasing dramatically, with a 405% increase in the rate of definite suicide attempts and a 184% increase in suicidal ideation (Ursano et al., in press). Although suicide data have historically been recorded in death records and tracked by the DoD, suicidal ideation or attempts data are more difficult to monitor, which is why this new recording system was implemented. In addition, suicide ideation may be underreported in particular settings, such as in postdeployment, military-specific health assessments that rely on self-reports (Hourani, Bender, Weimer, & Larson, 2012). Using HADS overcomes the issue of self-reporting; it can be used to tackle questions around why the incidence is rising so quickly, which personnel are most at risk, and in the longer term can help the U.S. DoD and Department of

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Veterans Affairs (VA) design appropriate interventions.

The methods used in HADS can provide insight into approaches that can be utilized in other military contexts. The United Kingdom is the obvious comparison (Sundin et al., 2014), given similarities in recent deployments to Iraq and Afghanistan. However, there are differences in the overall prevalence of suicide attempts (e.g., Pinder, Iversen, Kapur, Wessely, & Fear, 2012) and suicide (e.g., Fear et al., 2009); lower in both serving (Fear et al., 2009) and formerly serving U.K. personnel (Kapur, While, Blatchley, Bray, & Harrison, 2009). The increasing incidence reported in the United States is also not replicated in U.K. data (Defence Statistics (Health), 2014). At present, it seems unlikely that the U.K. Ministry of Defence (MoD) would implement a similar administrative system to monitor suicide attempts across health care services given that this problem is not as evident in the U.K. military. In addition, administrative recording in the U.K. and U.S. health care systems differs. One way in which it may be possible to monitor suicide attempts and self-harm in the United Kingdom is using existing electronic health records for hospital admissions to the National Health Service (NHS) and to Defence Medical Services (including for emergency health care services), which use *International Classification of Diseases* (*ICD*) codes, or similar, to record the reason for admission. Although these health care data do not identify which patients are currently in the Armed Forces, it would be possible to link these records to data such as the U.K. MoD personnel database (Defence Statistics (Health), 2014) or the King's Centre for Military Health Research (KCMHR) cohort study (Fear et al., 2010; Hotopf et al., 2006), replicating the methods of previous successful record linkages (Forbes et al., 2012; Kapur et al., 2009; MacManus et al., 2013), to examine the prevalence and risk factors for suicide attempts the U.K. military. However, this would cover only suicide attempts for which help had been sought and may, therefore, pick up on only the more severe attempts and incidents of self-harm. This would be less reliable than studies that have used national records linked to Defense Statistics data to assess suicide, in which all events are recorded (e.g., Kapur et al., 2009).

The current study showed that suicidal ideation and suicide attempts were more common in females, non-Hispanic Whites, those who were never married, those holding lower ranks, and those who joined the Army at a younger age (defined as younger than age 21) (Ursano et al., in press). The female increased risk for self-harm replicates existing findings but is the reverse to the increased prevalence in males for fatal suicides (Schrijvers, Bollen, & Sabbe, 2012), which may relate to gender differences in modality of suicide (Värnik et al., 2008). In U.K. research, which has predominantly relied on self-reports (Dazzi, Gribble, Wessely, & Fear, 2014), self-harm or attempted suicide is associated with lower rank, childhood adversity, and psychological morbidity, with the strongest association shown for post-traumatic stress disorder (PTSD) (Pinder et al., 2012). In the U.K. Armed Forces, common mental disorders are more prevalent than PTSD (Fear et al., 2010; Goodwin et al., 2015), which may explain the lower prevalence of self-harm. A further study has shown that relationship problems, employment problems, and alcohol misuse are all common in Armed Forces personnel who had presented to hospital with self-harm (Hawton et al., 2009).

It is a priority to identify which serving personnel are most at risk of suicide ideation and attempts to reduce the incidence of future events and to prevent suicides, which are most strongly predicted by previous attempts (Joiner et al., 2005). A focus on interventions targeting risk of suicide attempts may be more beneficial than concentrating only on those at risk of suicide, given that this outcome is confounded by the modality of suicide. Analyses of HADS and other sources of "big data" not only offer

valuable data for the U.S. DoD but can also inform other military populations. The data presented in this paper are just a starting point; there is much more that can be learned and opportunity for cross-country comparison.

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