Commentary on "A Conceptual Framework for Understanding the Mental Health Impacts of Oil Spills: Lessons from the *Exxon Valdez* Oil Spill"

Resilience and Variability Following Oil Spill Disasters

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Disasters are natural or technological events that cause sweeping damage, hardship, and loss of life. Their consequences are usually long-lasting and span multiple strata of society. Although disasters have plagued human civilization literally since its inception, it is only in the past several decades that research and theory on disaster has gained currency. Comprehensive reviews of the recent literature emphasize the multifaceted nature of disasters and the complex, interrelations between their predictors and consequences (Bonanno, Brewin, Kaniasty, & LaGreca, 2010; Neria, Galea, & Norris, 2009; Norris, Friedman, Watson, Byrne, & Kaniasty, 2002a). National and international efforts to develop expedient and effective disaster interventions have appropriately mirrored these complexities by focusing on the shifting interactions between individual survivors, families and the impacted communities over time (Hobfoll et al., 2007; Norris, Friedman, & Watson, 2002b; Watson, Bymer, & Bonanno, 2011).

Major oil spills are a specific type of technological disaster that engenders far-reaching but relatively poorly understood consequences. Major oil spills have eluded systematic study, at least in part, because they occur relatively less frequently than other types of disaster. Another likely reason is that the dominant paradigms for understanding disaster have placed heavy emphasis on Posttraumatic Stress Disorder (PTSD), and although oil spills might potentially produce PTSD, their unfolding is less acute and less clearly "traumatic" in the formal sense of the term than other types of disaster, and thus less readily accommodated by existing disaster paradigms.

PALINKAS'S THREE-TIER MODEL OF OIL SPILLS

Two recent and highly impactful oil spills, the *Exxon Valdez* disaster off the coast of Alaska in 1989 and the *Deepwater Horizon* disaster that has plagued the Gulf of Mexico since 2010, have underscored the limitations of existing knowledge specific to oil spills and have galvanized efforts to foster new research and intervention strategies. In

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this context, Lawrence Palinkas provides a vital foundation for consolidating the existing corpus of research on oil spills, for guiding intervention, and for highlighting and advancing unanswered questions for further research.

The three-tier model proposed by Palinkas reflects the broader, integrative literature on both natural and technological disasters. In developing the specifics of the model, Palinkas draws heavily from the extensive research program his own group on the *Exxon Valdez* oil spill. Expanding from these data, Palinkas conceptualizes oil spills in terms of three tiers of impact representing the environmental consequences, the consequences for social relations and the broader community, and the consequences for mental health among individuals.

Among the strengths of Palinkas's three-tier approach is that it encompasses many aspects of disaster overlooked in individual studies. Until recently, for example, surprisingly little systematic research has been conducted on children's reactions to disaster (Norris et al., 2002a; Silverman & La Greca, 2002). The available data suggest, however, that although children and youth often evidence similar patterns of response to those seen in adults (e.g., Le Brocque, Hendrikz, & Kenardy, 2010), the particular developmental concerns of childhood raise a number of unique considerations, for example, response to family and caregiver stress (Hoven et al., 2005), that warrant specific consideration in any integrative framework (Bonanno et al., 2010).

Another particularly important contribution of the Palinkas approach is that it not only captures the multifaceted nature of disaster impact, it explicitly argues for the interrelationship among these impacts. For example, the cultural and economic impacts (Tier I) may directly influence levels of support and familial and community relations within the affected area (Tier II), which in turn are likely to influence the mental health of individual members of the community (Tier III). The model also allows that the direction of influence for some links may be reversed, such that deteriorating mental health may negatively impact community cohesion, which in turn may interact with or inform the tendency toward litigation.

As rich and complex as Palinkas's three-tier model may be, it is arguably still not broad enough to capture the full range of mental health responses to oil spill disasters. Taking as my cue the integrative spirit of Palinkas's work, in the present article I consider ways in which the three-tier model might be extended even further to accommodate the rich variability in human stress responding. I begin by considering several limitations in Palinkas's conceptualization of outcome variability as well as the assumptions that drive these limitations. I next consider recent theoretical developments pertaining to the concept of outcome heterogeneity and recent empirical studies demonstrating the viability of different trajectories of long-term outcome. In reviewing this literature, I place special emphasis on the prevalence of the resilience trajectory and also distinctions between chronic dysfunction and recovery. Finally, I close with suggestions for how these developments might expand the three-tier model.

THE LIMITS OF DIAGNOSES AND THE PROBLEM OF AVERAGES

A major limitation that until recently has encumbered most theoretical approaches to trauma and disaster, including the model proposed by Palinkas, is an overly narrow conceptualization of outcome variability that fails to account for the full diversity of responses to stress, including chronicity and human resilience. Palinkas's model is multifaceted and describes several different sets of disaster impact. However, variability in each of these impacts is conceptualized in only two ways: either in terms of extremes, such as categories of pathology or dysfunction, or in terms of average levels of performance,

as exemplified by mean comparisons of exposed and non-exposed groups. Although such conceptualizations are common in the disaster and trauma literature, they unnecessarily constrain understanding of these events, a problem my colleagues and I have referred to as the limits of diagnoses and the problem of averages (Bonanno et al., 2010, Bonanno & Mancini, 2012in press; Bonanno, Westphal, & Mancini, 2011).

The parsing of outcomes in terms of the binary categorization of pathology or dysfunction is far and away the dominant approach currently used to understand trauma and disaster. From a historical perspective this makes perfect sense, of course, because psychiatric diagnoses and other forms of categorical outcome are essential in identifying survivors most in need of intervention. However, as we move forward toward broader, more integrative models of trauma and disaster, the limits of binary categorization become apparent. In the absence of additional data, pathology-based approaches simply lump all non-pathological responses into a single monotonic category. As a consequence, health and resilience can only be defined in overly simplistic terms as the absence of diagnosable psychopathology. Yet, defining resilience as the absence of a disorder is akin to defining health as the absence of disease (Almedom & Glandon, 2007). In such a system, it is nearly impossible to identify or understand different patterns of non-pathological responding or to determine whether the relative absence of symptoms and distress are best understood as a dysfunctional aberration, a normal response, or the result of extraordinary coping ability (Bonanno, 2004).

The other common approach to trauma and disasters, referred to as the event approach (Bonanno et al., 2011), conceptualizes the impact of these events in terms of average differences, odd-ratios, or other measures of global differences between groups, such as exposed versus non-exposed groups. Palinkas utilizes the event approach, undoubtedly because average scores and odd-ratios are accessible and informative statistics for describing both within-group and between-group predictors. However, similar to the focus on categories of dysfunction, average-level comparisons provide relatively little information about the distribution of responses or about the prevalence of resilient outcomes. Indeed, averaged responses are potentially misleading because they often bear little resemblance to the actual outcome patterns that are typically observed (Bonanno et al., 2010, 2011). For example, sample means for PTSD in trauma-exposed populations are typically high soon after the event and gradually decrease toward baseline levels across the first year after the traumatic event (Breslau, 2001). This pattern is widely taken to represent the normative response. Yet, as I discuss further below, when actual patterns or trajectories of individual variation are estimated, the trajectory suggested by the averaged data turns out to be relatively infrequently observed.

HETEROGENEITY AND RESILIENCE

The limitations of binary categorization and average-level comparisons stem from a fundamental misconception about the nature of response variability across time. These approaches implicitly assume that variability over time conforms to a *homogeneous* distribution (Duncan, Duncan, & Strycker, 2006; Muthén, 2004), and that responses to potentially trauma events can be arrayed along a single normal distribution that stretches from health at one end and psychopathology at the other. A pattern of recovery from initially acute symptoms would then represent the mean response pattern. By contrast, recent theoretical (Bonanno, 2004, Bonanno et al., 2010, 2011) and statistical (Curran & Hussong, 2003; Jung & Wickrama, 2008; Muthén, 2004) advances have dramatically underscored the natural *heterogeneity* of human stress responding.

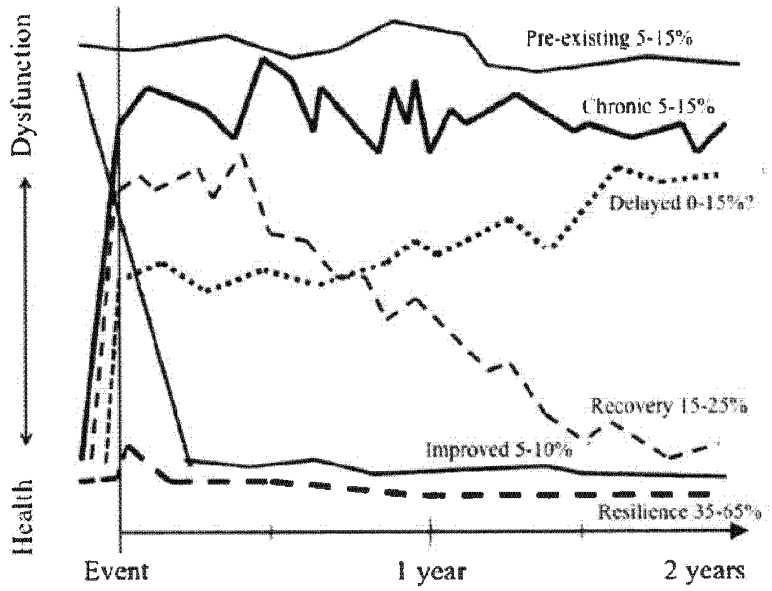

FIGURE 1. Common Outcome Trajectories Following Potentially Traumatic Life Events

A growing body of research has convincingly demonstrated that outcome heterogeneity following trauma and disaster is best captured, not by binary categorization or by average-level comparisons but rather by a relatively small set of prototypical patterns or trajectories of outcome across time (Bonanno, 2004; Bonanno et al., 2010, 2011). I depict the more common trajectories along with the estimated frequencies with which they tend to occur in Figure 1. Key in this approach is the identification of a *resilience trajectory*. Contemporary models of trauma and disaster, including Palinkas's three-tier model, have increasingly acknowledged the role of risk and resilience factors. However, the resilience trajectory is more than a collection of health-promoting factors or a category of relatively good adjustment. Rather, the resilience trajectory explicitly describes a stable pattern of positive adjustment and health over time (Bonanno, 2004). Importantly, the resilience trajectory can be distinguished from other patterns of positive adjustment, such as a more gradual recovery pattern, as well as the complete absence of a stress response, which has been referred to as stress *resistance* (Layne, Warren, Watson, & Shalev, 2007). Most people, including resilient individuals, typically experience at least some distress during or immediately after potentially traumatic events. A key point, however, is that for resilient individuals stress reactions are usually transient and mild and do not significantly interfere with their ability to continue normal levels of functioning. Moreover, whereas complete stress resistance is relatively rare, resilience is typically the most common outcome trajectory observed (Bonanno, 2004; Bonanno, Rennicke, & Dekel, 2005; Bonanno et al., 2011).

Although less common, delayed reactions are also sometimes observed. These reactions differ markedly, however, from the classic description of a delayed reaction as an illusory or superficial health that stems pri-

marily from denial and at some later point abruptly gives way to elevated symptomatology. Recent longitudinal data suggest by contrast that delayed reactions are more appropriately described by an initial struggle with a moderate or sub-threshold level of symptoms that gradually worsens over time (e.g., Andrews, Brewin, Philpott, & Stewart, 2007; Bonanno, Rennicke, & Dekel, 2005; Bryant & Harvey, 2002).

At the opposite end of the adjustment spectrum, categories of dysfunction or pathology can also be further parsed into chronic and recovery patterns. In contrast to chronic dysfunction and pathology, which can persist for years after the event, the recovery pattern is characterized by elevated symptoms and some functional impairment after the event followed by a gradual return to normal levels of functioning (Bonanno, 2004).

Finally, when prospective data are available, two additional trajectories may be observed, each characterized by elevated symptoms and distress *prior to the event's onset*. One pattern, a continuous distress trajectory, describes individuals who had persistently elevated symptoms and distress before the event's onset and who continued to experience these difficulties during and after the event. In the absence of prospective data, such a pattern is difficult to untangle from pathology caused by the event and may confound observations and interventions. A related trajectory, distress followed by improvement, describes individuals who were also struggling prior to the event but then improved after the event's occurrence. The distress-improvement pattern has been identified in research on loss following chronic illness (Bonanno et al., 2002), divorce (Mancini, Bonanno, & Clark, 2011), and military deployment (Dickstein, Suvak, Litz, & Adler, 2010).

EXPANDING THE THREE-TIER MODEL

Applying the concept of outcome heterogeneity to oil spills suggests several relatively straightforward implications for expanding Palinkas's three-tier model. First and foremost, despite the network of possible impacts wrought by an oil spill disaster, relatively clear patterns of individual variation across time should nonetheless emerge. Outcome heterogeneity is most obvious for intrapersonal difficulties described in Tier III of the Palinkas model. For example, although oil spills cause myriad problems, a sizeable group of oil spill survivors will nonetheless likely evidence a resilience trajectory of stable health and adjustment. Moreover, as has been consistently observed across virtually all types of potentially traumatic life events, the resilience trajectory is most likely to be the most common response pattern in the aftermath of major oil spills. The other common longitudinal patterns (e.g., recovery over time, delayed symptom elevations, chronicity) are also likely to be observed and in similar proportions seen in other disaster studies (Bonanno et al., 2010). Essentially this would amount to the superimposition of Figure 1 onto each of the Tier III variables in the Palinkas model.

This observation, by extension, points up the crucial need for repeated assessments of adjustment, if possible beginning prior to the spill's onset, and continuing for a number of years afterwards (Bonanno et al., 2010). Palinkas and colleagues have provided important evidence for the mental health costs of the *Exxon Valdez* disaster by documenting elevated levels of PTSD symptoms, depression, anxiety, drug and alcohol abuse, and declines in health status among high-exposure survivors. However, most of these data were obtained from a single point in time. Repeated assessments would not only document the enduring impact of the disaster but would also be imperative for determining individual trajectories of adjustment. Some of the individuals suffering from elevated psychological and physical health deficits related to a spill will likely recover, for example, while others will not. From both a public health standpoint and a clinical intervention perspective, it will be imperative

to identify these different courses of outcome and the factors that inform them. In addition, whenever prospective data are available, it becomes possible to untangle chronic difficulties that may have predated the event from enduring symptoms and distress that arose in response to the event (e.g., Bonanno et al., 2002), which would further help clarify and focus intervention efforts.

This consideration in turn further illuminates how the trajectory approach might expand the utility of the three-tier model. It would be enormously informative, for example, to examine Tier I and II factors in relation to different longitudinal trajectories of Tier III adjustment. Such an analysis would reveal not only which factors are likely to predict elevated symptoms but also more informatively which factors would distinguish eventual recovery from chronic psychological and physical problems, as well as the factors that might predict the resilient and delayed patterns.

Importantly, heterogeneity is also likely to characterize at least some of the Tier I and Tier II factors, such as environmental impacts or social relations and support (e.g., Norris & Kaniasty, 1996), and suggests a complex web of intersecting and diverging trajectories and interactions would likely be observed. Although it is not always practical, especially with relatively small sample sizes, to model variability over time in multiple predictor and dependent measures, the increasing sophistication and variety of data analytic software have made it possible to at least consider exploration of these types of interrelations in some data sets (Feldman, Masyn, & Conger, 2009).

To summarize, Palinkas's three-tier model presents an important and welcome contribution to study of and intervention with oil spill disasters. However, owing to the enormous complexity of such large scale and enduring events, there is always room for extension and enhanced understanding. In this brief article, I considered the recent theoretical and empirical work on the heterogeneity of trauma and disaster outcomes and especially the growing literature on resilience in the face of such events. In the spirit of integration, I suggested several ways these considerations might be incorporated into the three-tier model, thus expanding Palinkas's seminal contribution further.

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