

Contingent Workers and Occupational Health: A review on the health effects of non-traditional work arrangements

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The goal of this review is to show a relationship between employment arrangements and occupational health of workers, where contingency of employment has a negative, and perhaps, causal relationship with worker health. To be included in this review a study must have met the criteria of containing a peer reviewed results and analysis discussion on the relationship between occupational health and employment arrangements. Based on the criteria, the researcher narrowed down 43 articles out of 154 selected for review. Ten of the articles were primary studies that showed a difference between the health exposures of contingent workers versus core workers in the same workplace. The accompanying literature reviews included must have provided conclusive interpretation of data; those not included contained analyses that were essentially redundant to earlier reviews. Search terms included, “occupational health and contingent work”, “occupational health and precarious work”, “worker arrangements”, “occupational health and gig economy”, and “contingent workers”. Although there are many occupational factors that can influence a worker’s health (such as, industry and location specifics), trends across industry capacitate the author to claim an overall negative relationship between the use of contingent workers and occupational health.

Exploring progressive opportunities will become more essential as industries and governments become aware of the negative effects precarious employment can have on occupational health and how that affects the bottom line. Three areas to be explored are, (1) the legal responsibility for all parties involved, (2) how the presence of contingent workers may affect the attitudes and behaviors of currently employed core workers, and (3) the potential growth and acceptance of contingent work in today’s market.

Introduction and Overview

Since the transcendence from hunter-gatherer to agrarian societies, humans have maintained a hierarchical arrangement between those willing to compensate and those willing to perform work. Looking beyond the antiquated modes of production (i.e. slavery and feudalism), capitalism and its socialized variants has given rise to varying balances of employer/employee relationships. Motivated by stability and flexibility harmonization, employers today will often balance those relationships through their use of internal and external hiring practices (Kalleberg, Reynolds, & Marsden, 2003). The practice of external hiring practices, or externalization, refers to “an organization's use of workers who are not its regular, full-time employees” and internal hiring practices, or internalization as “regular full-time employment” (Kalleberg et al., 2003, pp. 525-526).

There is a plethora of terms that can be and have been used to describe the employment arrangements that both externalization and internalization produce. So, for the sake of fluidity this review will recognize two specific terms as the parent descriptors of types of employment. First will be core workers, which will be defined as those with traditional ties to their employer and treated as though they have a stake in the company (Belous, 1990). The other, the focus of this review, will be known as contingent workers which are defined by the Bureau of Labor Statistics (2005) as “those who do not have an implicit or explicit contract for ongoing employment.” Also, to be noted, the term precarious worker is used interchangeably with contingent worker. More often, however, precarious worker is a term used to define a contingent worker that is more vulnerable to job insecurities such as having no enduring contract and lacking control over future income opportunities (Landsbergis, Grzywacz, & LaMontagne, 2014).

Historical Context

The rise in contingent work arrangements is not a new phenomenon as it existed ubiquitously throughout the 19th and early 20th centuries (Quinlan, Mayhew, & Bohle, 2001). Contingent work and precarious employment, historically, were quite common until its use began to decline in developed countries, probably because of political and societal influence (Benach & Muntaner, 2007). Some examples include, legislation like the New Deal¹ and the growth of organized labor in the 1930s that influenced the use of the more permanent core worker (King, 2014). In addition, industrial advancements such as mass production may have also influenced the shift from precariousness to more solidified employment arrangements (Quinlan et al., 2001).

It was not until the 1970s that the United States began to see a significant decline in permanent employment and a shift back to more precarious forms of employment. King (2007) attributes the backshift to deindustrialization, outsourcing, new technologies, deregulation, and union decline. It

¹ “New Deal, the domestic program of the administration of U.S. President Franklin D. Roosevelt between 1933 and 1939, which took action to bring about immediate economic relief as well as reforms in industry, agriculture, finance, waterpower, labour, and housing, vastly increasing the scope of the federal government’s activities” (Editors of Encyclopædia Britannica, 2018).

may also be important to consider macroeconomic changes such as the oil shock in the 1970s and its influence on markets and global price competition (Kalleberg, 2009). It is no coincidence that temporary employment increased 11% from 1972-1986 (Abraham, 1990). Furthermore, some analyses claim the 1990s produced neoliberal politics that created an ideal environment for the added expansion of precarious employment (Quinlan et al., 2001). The 2008 “Great Recession” is a more recent example of a cause for labor market reforms that affected employment conditions and population health because lower wages were being paid, working conditions were worsened, and flexible employment was on the rise (Benach, Vives, Amable, Vanroelen, Tarafa, & Muntaner, 2014).

Today, flexible employment is quite appealing to employers. Companies seek out flexibility to keep up with changing market influences and thus, consequently, hire individuals who are willing, or forced by circumstance, to tie their careers to economic variables and business strategies (Belous, 1990). In many industries, contingent workers are used to offset some of these market variables (Dey, Houseman, & Polivka, 2010; Kochan, Smith, Wells, & Rebitzer, 1994).

Inadequacies of Surveillance Systems

Occupational health, in general, is a difficult area to attain comprehensive data as datasets are often fragmentary. Efforts have been made to increase data accuracy and availability through additions to traditional surveillance systems. Some efforts include those made by the National Center for Health Statistics (NCHS), the Behavioral Risk Factor Surveillance System (BRFSS) and clinicians to begin including occupational information in surveys and records (Laney & Storey, 2014). Unfortunately, these efforts, although they add to the field of study, have not created exhaustive data sources. The United States does not have a comprehensive national surveillance system for occupational injuries and illnesses. It relies on systems such as: state workers’ compensation data (includes mostly acute occupational injury and illness data based on claims by employees in the event they are unable to work for any period of time), the Bureau of Labor Statistics annual survey (includes occupational injury and illness data from private industry based on information retrieved from Occupational Safety and Health Agency [OSHA] 300 logs), and physician reports (includes state required data reporting on common occupational illnesses such as pneumoconiosis and musculoskeletal disorders). Although, these surveillance systems are vast they have shown underestimations to be as high as several hundred percent (Azaroff, Levenstein, & Wegman, 2002). About contingent workers, Foley et al. (2014) states, “Various occupational injury and illness data systems, including workers’ compensation and those built on OSHA recording, may capture these workers differently, creating ambiguities interpreting data and compounding difficulties with occupational safety and health surveillance and epidemiological studies.”

Misclassification is a key influencer of the fragmentary nature of occupational health data pertaining to contingent workers. Employee rights are normally based on the idea of a predefined employee/employer relationship, and often that relationship can become obscure when the employee is a contingent worker, thus resulting in confusion about incident reporting (Foley, Ruse, Shor, Shuford, & Sygnatur, 2014). The employer that is legally required to report injury and illness on a certain employee may not be obvious in a non-traditional work arrangement. Misclassification

happens because of a failure to develop global consistency concerning definitions. For example, in Europe contingent employment includes apprenticeships and direct-hire fixed-term contractor workers, whereas in other places it does not (Foley et al., 2014).

Review of Literature

The goal of this review is to show a relationship between employment arrangements and occupational health of workers, where contingency of employment has a negative, and perhaps, causal relationship with worker health. To be included in this review a study must have met the criteria of containing a peer reviewed results and analysis discussion on the relationship between occupational health and employment arrangements. Based on the criteria, the researcher narrowed down 43 articles out of 154 selected for review. Ten of the articles were primary studies that showed a difference between the health exposures of contingent workers versus core workers in the same workplace. The accompanying literature reviews included must have provided conclusive interpretation of data; those not included contained analyses that were essentially redundant to earlier reviews. Search terms included, “occupational health and contingent work”, “occupational health and precarious work”, “worker arrangements”, “occupational health and gig economy”, and “contingent workers”. Although there are many occupational factors that can influence a worker’s health (such as, industry and location specifics), trends across industry capacitate the author to claim an overall negative relationship between the use of contingent workers and occupational health. The remainder of this section will be dedicated to displaying that relationship.

Primary Study Results (Contingent versus Core)

In 1986 a petrochemical plant in Pasadena, TX had an explosion. The explosion involved an outside contracting firm and sparked debate over the growing use of contract workers (Kochan et al., 1994). In 1989, in response, OSHA conducted a study of the use of contract workers in the petrochemical industry through a national survey of 600 direct hire and 600 contract employees (Kochan et al., 1994). It found that contract employees accounted for 32% of the average work hours, and were less educated, less experienced and received less overall health and safety training than did core employees (Kochan et al., 1994).

The Department of Labor administered a nationally representative stratified random survey on farm workers. The results showed that health insurance and worker’s compensation benefit access for contingent workers was lower than for core workers (Asfaw, 2014).

Representing each group equally, Sweden’s Labor Market Survey conducted a study on short term and permanent employees. The study found that contingent workers would self-report on the lack of work environment knowledge more than core workers (Aronsson, 1999). It also found that, more often, contingent workers would report experiencing discouragement from creating dialogue with supervision as well as a lack of essential training (Aronsson, 1999).

Results of interviews of 40 individuals in the hospitality industry suggest that contingent employees experience work related stress more often than core employees (Madden, Kidder, Eddleston, Litzky, & Kellermanns, 2017). Similarly, a job satisfaction study by Wilkin (2012) took the meta-analytic results from 72 primary studies and found that job satisfaction among

contingent workers was slightly lower than that of core workers. Wilkin (2012) explains that the reason for the small but significant difference is that in many of the 72 studies contingent workers were viewed as a homogenous group instead of considering that some types of contingent workers (e.g. contractors) may experience more job satisfaction than other types of workers (e.g. temporary agency workers).

A work-life conflict and health study was taken at two five-star hotels through interviews of 26 core workers and 13 contingent workers (Bohle, Quinlan, Kennedy, & Williamson, 2004). The study found that contingent workers complained more about health and were more likely to have irregular working hours (Bohle et al., 2004). Health related concerns related to work-life conflict of contingent workers included: sleep disturbance, fatigue, lack of exercise, and bad diet (Bohle et al., 2004). The main difference between the permanent core workers and the temporary contingent workers was not that one group worked more hours than the other, but rather the core workers had some control over their time off to seek rest or care (Bohle et al., 2004). A similar study into worker's compensation claims in Victoria, Australia found that temporary agency workers experienced more acute health risks than direct hire core employees (Underhill & Quinlan, 2011). It was suggested that a fear of job loss kept the temporary agency workers from reporting incidents and requesting time off to recover from sickness—7% of temporary agency workers versus 1% of direct hire workers claimed to be afraid to take sick leave (Underhill & Quinlan, 2011).

The European Union Statistics on Income and Living Conditions (EU-SILC) Survey by the Italian Institute of Statistics gathered random samples of private homes from all European countries (Pirani & Salivini, 2014). Individuals in various employment arrangements were studied between 2007 and 2012 and followed up annually to inquire about their general overall health (Pirani & Salivini, 2014). The study found that temporary employment negatively impacted an individual's health when that employment arrangement was prolonged over time. When a temporary worker had the promise of permanent work within 1 year there were no negative effects to health noted (Pirani & Salivini, 2014).

The results of these primary studies are summarized in the table below to show the relative trend in occupational health exposures between contingent and core workers.

Summary of Primary Study Results

Has More or Less	Contingent Workers	Core Workers
Job Knowledge	Less	More
Access to Health Benefits	Less	More
Work-Related Stress	More	Less
Requests Sick Leave	Less	More
Job Satisfaction	Minimal difference	Minimal difference
Good Overall Health	Less	More

Psychological Implications

Desire for flexibility will have the employer argue that contracting out creates more job opportunities, however, it can be rebutted that this type of employment has severely reduced job security (Dey et al., 2010). Logically, it can be inferred that a work arrangement that is laden with those insecurities should have the potential to create apprehension amongst those workers. Throughout the literature this hypothesis is raised either blatantly or subtly and each time it is proven. Workers in insecure employment self-report morbidity at a higher rate than those in more secure positions (Benach & Muntaner, 2007).

The actual existence of job insecurity is irrelevant as *perceived* job insecurity may be equally influential upon the psyche of workers. Perceived job insecurity is defined by Harley (1999) as, “a perceptual phenomenon resulting from a process of cognitive appraisal of the uncertainty existing from the organization and the employee.” There is a significant correlation between health and perceived job insecurity. Both, contingent and core workers, experience job insecurity and suffer from the same effects, thus, making the individual the volatile variable (Benach et al., 2014). Understanding that, it can also be noted that contingent workers reported worse working conditions and less job continuity, and that can cause unstable employment perceptions which also act as a chronic stressor leading to ill mental health and other health inequalities (Benach et al., 2014; Benach et al., 2007).

The precariousness of contingent work is also a psychosocial detriment that has been known to affect the health of the worker (Benach et al., 2014). Low reciprocity between employers and contingent workers exist through a lack of trust and this might lead to ill-health. This lack of trust breeds an environment where work hazards go unreported, training requests are not made, and personal injuries are not known (Facey & Eakin, 2010). In many cases, workers who report health concerns are at risk for retaliation from supervisors (Azaroff et al., 2002). In a study reported by Aronsson (1999), there was an environmental accident and workers were poisoned because precarious contract workers, suffering from toxic exposure, did not report the hazard for fear of losing their jobs.

This same fear can lead to such phenomena as presenteeism. Presenteeism is a concept that workers will come to work while sick. Sometimes temporary workers are recorded in data sets as having better health, but that is merely a sign of the “healthy worker effect”, where most temporary workers lack paid sick leave and therefore are more inclined to work while sick (Landsbergis et al., 2014). In short, presenteeism is indirectly encouraged through a fear of consequences coupled with the financial implications of having no paid sick leave. Hidden costs of presenteeism include long-term health of the worker, sick workers infecting others, and slowed productivity by sick workers (McNamara, 2006). McNamara (2006) notes that the Employers Health Coalition of Tampa, FL, analyzed 17 diseases and estimated that lost productivity from presenteeism was 7.5 times greater than productivity loss from absenteeism.

Work-related stress affects all workers and has been known to be a major precursor to chronic health issues. There are many reasons a worker can become stressed and many of those reasons are inherently existent within non-traditional work arrangements. A literature review of 27 studies

on temporary employment and health found that there is higher psychological distress among temporary employees than among core employees (Virtanen, Kivimaki, Joensuu, Virtanen, Elovainia, & Vahtera, 2004).

McNamara (2006) suggests that workers who are employed casually may face stress because of the enduring need to adapt to new work processes and gain supervisor approval. Adapting to peers becomes a task as well, especially for those contingent workers that work alongside core workers. These workers risk social exclusion, and that has been known to lead to increased reports of psychological, psychosomatic, and musculoskeletal health complaints (Face & Eakin, 2010). This form of discrimination was noted in the 4th Korean Working Conditions Survey of 50,000 workers by the Korea Occupational Safety and Health Agency. They found that workers that experienced discrimination in the workplace reported more health issues, and that contingent workers were up to 1.83 times more likely to experience workplace discrimination (Kang, Song, Paek, Park, & Chun, 2017).

In addition to a feeling of separation, contingent workers may experience time pressure and fear of job loss as stressors (Vahle-Hinz, 2016). These stressors attribute to the stress of contingent workers. However, Vahle-Hinz's results only partially support this claim. Regardless, the results still showed that uncertainty about the work environment and time pressure constraints were significant enough stressors to at least consider when analyzing non-traditional work arrangements (Vahle-Hinz, 2016). These employment stressors that lead to feelings of chronic job insecurity have a dose-response relationship with physical and mental health and an increased risk of psychiatric morbidity (Landsbergis et al., 2014).

Limitations of Literature

As a disclaimer, it must be noted that much of the literature about the consequences of using contingent workers is underdeveloped and relying on, mostly, nonrandom samples of data (Pedulla, 2013). Statistical analysis of the currently available data would be unavailing because of the variations in collection methods that may, or may not, compensate for possible confounding factors such as industry or locale specific health influencers. Considering these hindrances, it should also be noted that the literature is growing, and evidence is beginning to show that work arrangement may have a significant influence on worker health (Howard, 2017).

Discussion on the Relevance and Importance

Results of the literature review appear to suggest that there is at least some causal relation between employment arrangements and occupational health. These results inspire questions concerning industries' incentives to utilize contingent workers. Incentive is found in risk assessment. As mentioned earlier, the use of contingent workers is often viewed as an economically fueled endeavor because of the flexibility that accompanies such arrangements. However, in response to that claim McNamara (2006) argues that it may not be as monetarily sound as one might think by stating:

It is argued that when the adverse effects of casual employment are taken into account, the apparent advantages do not outweigh the costs, which include

increased insecurity, intensification of work and longer working hours. The adverse outcomes of casual employment are costly for organizations. When designing [Occupational Health & Safety] OHS management systems additional measures should be taken to assess the added risk associated with casual employment.

Exploring progressive opportunities will become more essential as industries and governments become aware of the negative effects precarious employment can have on occupational health and how that affects the bottom line. Three areas to be explored in this discussion include, (1) the legal responsibility for all parties involved, (2) how the presence of contingent workers may affect the attitudes and behaviors of currently employed core workers, and (3) the potential growth and acceptance of contingent work in today's market.

Legal Responsibility/Implications

Sometimes there can be ambiguities in non-traditional work arrangements between employer and employee. Determining who a contingent worker's legal employer is may not be straightforward. There are risks associated with misclassification of employment, legislative and governmental considerations, and the existence of hybrid co-employment situations.

When hiring contingent workers, the classification of employee versus independent contractor becomes problematic. Employees are sometimes entitled to more benefits than independent contractors and in the event of a misclassification during an injury or illness an independent contractor may be able to claim benefits as an employee (Koen, Mitchell, & Crow, 2010). Furthermore, insurance companies may not feel that they are liable to pay for medical care because the independent contractor was never covered, thus leaving the employer with a large financial burden (Koen et al., 2010).

There are legislative acts that highlight the issue of employee classification and associated rights. The Fair Labor Standards Act (FLSA), as interpreted by the Supreme Court, states that there is no single test to define what arrangement constitutes an employee status or independent contractor. The FLSA also notes that the fact that an employee lacks a permanent relationship with his or her employer does not mean that that employee is now an independent contractor (Department of Labor, 2014). According to the Affordable Care Act (ACA) and Internal Revenue Service (IRS) interpretation an individual is considered a "common law" employee if the employer controls how the individual performs his or her work (Marathas & Myers, 2014). Classifying individuals as independent contractors may sometimes be necessary, but the risk of misclassifying could lead to "pay-or-play" penalties under the ACA (Marathas & Myers, 2014). The purpose of understanding how misclassification may affect employers in areas dealing with the ACA or the FLSA is significant because it gives a legal precedent for how other situations (e.g. those related to occupational health) may be handled.

Historically, there have been uncertainties about employer roles and responsibilities as it pertains to contingent workers. Firstly, there is the concept of a Professional Employer Organization (PEO). This concept is where the PEO hires another company's employees so that they do not assume the risk of employee management of benefits, workers' compensation, health and safety management,

and training, but rather remain the employer for tax and insurance purposes (Foley et al. 2014). This concept is known as co-employment. In Louisiana, for example, the PEO may be referred to as a statutory employer; and the statutory employer is no longer responsible for its contracted employees' workers' compensation obligations (La. R.S. 23:1061). However, to achieve this status it must be explicitly spelled out in the contract (La. R.S. 23:1061). In *Blanks v. Entergy Gulf States Louisiana, LLC* (2016) a contract construction worker who was injured on an Entergy jobsite claimed that he should be able to recover losses from Entergy itself, in addition to those recovered from his direct employer (Boutwell, 2016). A lower court ruled in the contract worker's favor; however, an appeals court determined that the merits of the case were not sufficient to deny Entergy of its statutory employer status (Boutwell, 2016). In a similar case in California the National Labor Relations Board (2015) issued a decision between Browning-Ferris Industries (BFI) and Leadpoint. Leadpoint supplied employees to work for BFI and the National Labor Relations Board decided that both organizations would serve as joint employers.

It seems that it is becoming increasingly critical that employers fully understand employee classification as well as their role to that employee to avoid certain liability risks. The growing use of contingent workers will undoubtedly grow that liability potential with future court rulings and legislation.

Workplace Attitude and Culture

The risks to employers are not always as monetarily direct as legal classification, but rather subtler and of a chronic nature. Positive workplace attitude and culture is preached at almost all places of employment as an encompassing organizational goal. However, when it comes to employers planning to use contingent workers it may be wise, for them (the employers), to acknowledge the possible effects the introduction of that type of employment may have on their current core employees. Research has shown that human resource managers were initially wrong in their assumptions about contingent worker and core worker relations (Jannifer, 2005). Core workers can feel cheated because of the use of contingent workers and that can affect their work (Jannifer, 2005). Employers will use contingent workers under the premise that the flexibility to changing market conditions that contingent employment brings allows them more time and resources to spend on developing valuable and long-term relationships with their core employees (Foley et al., 2014). However, that is the employer's rationale, not the workers'. The core workers' point of view should be considered because they may not view the addition of contingent workers into their work environment as valuable to the company or to their own career objectives. An empirical analysis by Pedulla (2013) found that the use of contingent workers was negatively related to core employees' pride in company and organizational trust towards managers. In the previously mentioned case study about a petrochemical explosion involving contract workers it was found that core workers and contingent workers both reported tension, conflict, and communication breakdowns between the two groups (Kochan et al., 1994). Additionally, the mere presence of contingent workers could upset working conditions by increasing demands for core workers as the full-time workforce is reduced (Aronsson, Gustafsson, & Daliner, 2000).

The Growth of the Gig Economy

The gig economy is a colloquial term used to label a sector of the growing freelance workforce where workers take on gigs, or small contracts, as oppose to long term employment. The growth of the gig economy, by nature of its definition, will give rise to even more forms of precarious and contingent work. Workers that accept gigs are some of the most precarious type of workers with possible health implications that have not been fully explored yet. For example, because of the lack of regulatory framework for hazard prevention in gig working relationships, at-home workers providing gig services might work in ergonomically poor workstations and risk all the health issues associated with that (Tran & Sokas, 2017). As an added disadvantage that same worker would not have access to health insurance or workers' compensation (Tran & Sokas, 2017).

In the current political climate² there are emerging efforts to address some of these health issues and their relation to independent gig workers. An appropriate example can be seen in an organization known as the Freelancers Union. The Freelancers Union addresses this issue of stability while simultaneously allowing contingent workers to keep their flexibility (King, 2014). It engages in mutual aid of its members and advocates for policy changes in labor and employment laws to meet the needs of independent contractors and other contingent workers (King, 2014). The fact that there are sizable responses like the Freelancers Union is indicative of the growing acceptance of contingent work as a viable and abiding form of employment arrangement.

Future Needs

Data Surveillance

If employment arrangements are accepted as determining factors in occupational health, then intervention is warranted. Surveillance data is the fundamental basis on which all health interventions hinge. It is used to “estimate the magnitude of specific problems, determine the distribution of illness, portray the natural history of a disease, generate hypotheses, stimulate research, evaluate control measures, monitor changes, and facilitate planning” (Institute of Medicine Committee on a National Surveillance System for Cardiovascular and Select Chronic Diseases, 2011). The lack of sufficient surveillance data in the literature, though, suggests that progressive and innovative measures be taken to develop a clearer understanding of the relationship between employment arrangements and occupational health. Surveillance programs need to be modernized to more effectively recognize contingent work and its related factors. Benach et al. (2016) suggests a need for more precise definitions, detailed understandings of how contingent work affects worker health, development of a complex systems approach to employment conditions, and understanding that contingent workers' health may be affected by

²Current political climate refers to the remnants of the neoliberal politics of the 90's and early 00's mixing with today's extreme partisan polarization of politically active individuals. Also, opinions on the role of government has shifted towards a more left-leaning/authoritative view, because Democrats have essentially shifted their view of the role of government to be more extreme and Republicans did not shift further right (Doherty, 2017). Therefore, the balance favors a more centralized and influential government.

more than just their employment arrangement at certain sample times. Recognizing that there is no homogeneity among contingent workers is the essential in achieving future research needs and providing safe workplaces (Howard, 2017). Then, adding that concept to a more developed surveillance program can increase monitoring effectiveness. The National Institute of Occupational Safety and Health (NIOSH) (2013) complements this assertion with the updated version of their surveillance strategic goals that denotes non-traditional work arrangements (specifically those of contingent, temporary, and contract workers) as an important area where surveillance needs to be expanded.

Data surveillance can be expanded through regulation that supports new reporting requirements by employers. Regulating agencies, such as OSHA, can require employers to report all occupational health and safety incidents while including both leading and lagging indicators³. Legal requirements can also be set for clinical physicians to include employment arrangement in medical records. Lastly, all public health surveys could be required to include employment arrangement as a parameter. However, these requirements should not compel the creation of binary response choices for the sake of compliance. Merely asking if a worker's employment arrangement is contingent or definite may not be enough to develop a holistic understanding. Compounding factors such as, but not limited to, industry specifics, work location, and physical nature of actual job should be considered for inclusion in reporting requirements. Imposing requirements that will augment comprehensive data sets can strengthen the case for intervention and prevention.

Data can affect culture: history has shown that all progressive advancements in health intervention and prevention started from newly accepted data that sparked a cultural change in what was deemed acceptable. A good example is the Truth Initiative (1999) that sought to achieve "a culture where all youth and young adults reject tobacco." Decades of data supporting the relationship between smoking and cancer is what helped build public awareness. Initially there was little data supporting the cancerous nature of tobacco smoke, and in 1965 it was estimated that 42.4% of American adults smoked tobacco (Center for Disease Control [CDC], 2014). As new compounding studies influenced a cultural shift, the U.S. saw a steady decline in adult smokers, down to 16.8% in 2014 (CDC, 2014). The same concept can and should be applied to the seemingly inscrutable initiative to marry contingent work arrangements with poor occupational health. The development of supportive data and vacating the reliance on fragmented data sets are key to facilitating change.

Changing the Culture

³"Lagging metrics are a retrospective set of metrics that are gathered after the occurrence of an incident that has met an established threshold of severity. Lagging metrics evaluate the causes of an incident and whether the factors that led to the incident indicate potential recurring problems...Leading metrics are a preventive set of metrics that reveal the performance of key work processes, operating discipline, and layers of protection that prevent incidents" (OSHA, 2016).

Aside from developing strong surveillance systems a more direct preventative measure to the health effects of contingent employment may lie within workplace cultures and how contingent workers are treated. If policy and economics show unwavering support for contingent work arrangements, then local (e.g. municipality, workplace, etc.) programs should be initiated to influence a people's acceptance of contingent workers. Much of occupational health issues that arise from contingent employment are related (either directly or indirectly) to how employers, coworkers, and/or society view the differences between the economic, social, and legal connotations of traditional and non-traditional work arrangements. An example of addressing this concept can be seen in a study of the petrochemical industry where a processing plant decided to ignore their lawyers' advice and manage their contract workers in the same manner as their core employees (Kochan et al., 1994). After implementation, the plant saw a decline in health and safety incidents among their contract workers. Although this is a step in the right direction, Kochan et al (1994) goes on to explain that this is only a small step towards fixing a much larger systemic problem that needs the attention of management, labor, and government.

It would require an immense consensus among leaders of industry and government to develop an understanding culture within their own organizations to make any appreciable change at the macro level. Regardless, efforts, in the form of setting examples, need to come from top leaders to facilitate any longstanding change. Jim Whitehurst, President and Chief Executive Officer (CEO) of Red Hat Software, said, "If you want your culture to change, you need to reconfigure how you and your people work together in radically new ways. You must change the way you enable and empower people, so they can effectively operate in this new environment."

The will to pursue cultural change, concerning the acceptance of contingent workers, can come from data that supports both regulatory compliance and economic incentives. However, a deeper impression can be made on leaders through relentless campaigns that develop an empathic understanding of this marginalized sector of the workforce. Because of the recent success of businesses operating in the gig economy, the media has been giving the impression that contingent work is soon to become the predominant employment arrangement in the U.S. (Casselmann, 2018). It can be inferred that that is not the case by looking at the new results from the Bureau of Labor Statistics' 2017 Contingent Worker Supplement that show contingent workers only make up 3.8% of total employment. The numbers from the 2017 report were significantly lower than the numbers reported in the previous study conducted in 2005. This is by no means indicative of a dwindling population of contingent workers, but perhaps an illustration of how incomplete datasets can skew results. The 2017 Contingent Worker Supplement included four new questions that the 2005 study did not. These new questions could have removed individuals from BLS's definition of contingent worker and placed them under the alternative employment arrangement category. This also is not a sign that the contingent workforce is growing either. Whether or not contingent workers are rising to be the majority is irrelevant. What matters is that in 2017 there were 5.9 million contingent workers and 15.5 million in other alternative employment arrangements (BLS, 2018). Understanding that this is a definable class of people may be the first step to implementing change that can fuel acceptance and inclusion, and in turn improve occupational health conditions for contingent worker.

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