Key Issues in the Development of the ICD and its Effects on Medicine:

With an emphasis on Mental Health

> *You can know the name of a bird in all the languages of the world, but when you're finished, you'll know absolutely nothing whatever about the bird... So let's look at the bird and see what it's doing -- that's what counts. I learned very early the difference between knowing the name of something and knowing something.*
>
> *--Richard Feynman[1]*

On the Nature of Naming

Science, it is often written, is based on data and evidence. Data invariably involves counting things, which in turn implies that we can distinguish those things we quantify. To distinguish something implies that we can recognize categories, or to ontologists—classes. To keep track of such categories, we give them names, labels, or identifiers[2, 3].

We name things other than classes, we name instances too. There is a class of people (Homo Sapiens), but there are also specific people with specific names. This is the class-instance dichotomy. In the context of disease, it differentiates the abstract concept of a disease (say, pneumonia) from a specific patient who is diagnosed with pneumonia.

Informatics is the science of data; in this paper as applied to the domain of mental health. Informatics considerations deal with marshaling data into evidence, inferring knowledge from that evidence, and closing the loop by applying that knowledge back into clinical practice to improve care. Central to each stage of these processes is distinguishing categories. From the perspective of informatics, our writing, software, and implementations deal far more with classes than instances. This does not mean that informatics enabled systems cannot deal with patients, simply that informatics abstractions tend to focus more on categories of symptoms, findings, and inferred diseases in the construction of theories, demonstrations, and production systems. These systems are then implemented and used to help patients in clinical care.

Perhaps the single, largest "naming" effort in medicine is the International Classification of Disease, now maintained by the World Health Organization.

11th Revision of the International Classification of Disease (ICD-11)

The was a novel exercise in community engagement, distributed process, and modern computer science infrastructures. As described in more detail in the BMC special supplement[4] (in press), ICD11 was a dramatic departure from previous revisions in its scope, architecture, and computable basis.

The 11th revision engaged a broad spectrum of scientists, specialists, and domain experts organized into topic advisory groups (TAGs) under a coordinating Revision Steering Group chaired by CG Chute. From a content perspective, there were 12 medical TAGs, including Mental Health. In turn, the Internal Medicine TAG engaged 8 Working Groups of medical specialties, e.g. Cardiology. The membership of each TAG and Working group comprised about 20 experts drawn from around the world, typically nominated by specialty societies and WHO national member bodies. Thus, approximately 400 domain specialists directly participated in

ICD11 development. The Mental Health TAG stood out, in that each of the 20 TAG members engaged communities, associations, and specialty societies, bringing the number of experts ultimately contributing to the mental health section to well over 1,000.

The process of assembling and coordinating so many development participants required the extensive use of virtual meeting technology, foreshadowing its mainstream adoption during the recent COVID pandemic. At no time did all 400 members of the extended revision group meet in a single place. Meetings were federated within TAGs, with TAG leadership (typically co-chairs) meeting together as part of the Revision Steering Group. The steering group also included specialists in classification (morbidity, mortality, and statistics) as well as informatics.

The distributed work of the committee was greatly enabled by a shared informatics infrastructure, initially based solely on the iCAT tool developed by Stanford as a derivative of Protégé[5]. This distributed editor for ontologies allowed the asynchronous modification of evolving ICD11 content; the process evolved to authorize only TAG secretariats for editing to minimize conflicting content. Public browsers were established at WHO that allowed the development team to see the artifact as it evolved, as well as the interested public[6]. Commenting on the browser versions was permitted for the world.

The structure of ICD11 was also unprecedented, comprising an underpinning semantic network, or ontology, of major to highly detailed concepts, each framed in a specified content model[7]. This network, called the ICD11 Foundation, allowed branches to have arbitrary depth, and each concept could have multiple parents. These properties, while desirable for an ontology, violate the mutually exclusive (cannot count an instance more than once) and exhaustive properties (everything has a place) of statistical classifications, which at heart ICD has always been and functionally must be. To address this challenge, monohierarchic derivatives were created from the Foundation that selected a single parent for each concept, creating a classification consistent with the mutually exclusive property. The exhaustive property was satisfied by adding residual categories to branches, such as Not Otherwise Specified or Not Elsewhere Classified. We called these derivatives linearizations, harkening the ability to "walk" a monohierarchy in a straight line from beginning to end--suitable for printing in a book. By choosing which parent would be primary, WHO is able to create an arbitrary number of semantically coherent linearizations, optimizing relationships for morbidity, mortality, public health, translational research, or subspecialities like dermatology[8]. Creating a mental-health specific linearization would be an equivalent process, though this has not yet been done.

Relativistic Notions of Disease

Let us agree that naming things, and classes in particular, is useful in health informatics. Among useful things that can be named are diseases. Sadly, this line of reasoning can become abstract and philosophical very quickly. What is a disease? What is the threshold differentiating normal variation from a pathological condition? How many diseases are there? Are the considerations of disease in Mental Health materially different from others in allopathic medicine? Are symptoms disease? Does the representation of signs, symptoms, or disease impact interpretation or inferencing?

We considered all of these issues afresh in our strategies for ICD-11. Early in the process we added categories to the Foundation content model that would distinguish whether an entry was a disease, syndrome, symptom, clinical finding, or health condition. ICD rubrics can be all of

these. There is a tremendous different between having a family history of mental illness, and having a diagnosis of one. As with many details of the content model, overtime diligence in completing all dimensions of an entry for a concept diminished; this incompleteness is seen as an opportunity to continue the evolution and detail of ICD11 long after its initial release.

Normality

Variation in biology, from viruses to people, is a hallmark of living things (and snowflakes.) Human variation ranges from size and shape to personality and character. Variation is normal; when does variation become pathology?

For many human metrics, say hemoglobin concentrations in blood, we distinguish those with anemia (not enough) and polycythemia (too much) from the goldilocks-state of normal hemoglobin using statistical norms. Most clinical laboratories create numerical distributions of "normal" populations, presumably free of confounding diseases, and declare the tails of those distributions abnormal—by definition. The boundaries for these thresholds can be purely statistical (beyond the 95%ile limits in either direction) or correlated with increasing disease probability, e.g. male Prostate Specific Antigen's (PSA) > 4.0 ng/ml as a screen for prostate cancer. It is important to realize that having metrics or parameters "beyond normal" does not automatically imply disease. Consider that in any "normal" population of people, by definition, 5% will have values that are "too high" and 5% will have values that are "too low" without any evidence of disease or pathology. Abnormal values may correlate with disease, or at extreme values may be pathognomonic of disease (e.g. a PSA of 10,000 ng/ml, which is likely to mean only one thing diagnostically), but simple variation beyond the norm is not always a disease.

What about that name and class problem? If a woman has a hemoglobin below a normal value would she be labeled anemic? Many clinicians, particularly before severe fiscal restrictions on repetitive testing, would cure a lot of "disease" by repeating the test, which as often as not, would come back normal. Persisting low values, particularly in the face of causal circumstances such as iron deficiency, would however, likely infer disease.

Whither normality and pathology in mental health? We do not always enjoy the neat quantification available with hemoglobin to discern normal values. When does humor become snarkiness, and snarkiness meander into a personality disorder? Does talking to oneself land us among schizoaffective disorders? We all become sad, indeed most of us are transiently depressed from time to time. When does this become clinical depression bearing intervention? Can any of these subjective evaluations be quantified, to establish qualitative thresholds? This modest chapter will not presume to answer such questions, merely pose the informatics tools and concepts we might avail in our collective efforts to address them.

Manifestation as Mental Illness

The great taxonomist, Carolus Linnaeus, who created the binomial nomenclatures of all animal and plant taxa, genus, and species, brought his discerning mind to the problem of disease classification. He epic tome, Genera Morborum[9], attempted to classify known diseases into a taxonomy. Interestingly, he grouped rabies under mental illness. It is true that in the end stages of Rhabdoviridae infection, the attacked neural tissue of the brain renders patients confused, agitated, and hallucinatory—arguably a mental illness. However, few knowledgeable people today would primarily classify rabies a mental-health problem. Linnaeus in his time lacked a germ theory of disease, an insight that dramatically alters our perspective, knowledge, and consequently our theory and models for disease classification.

Freudian Enlightenment

Hippocrates is often credited with having documented the first non-magical theory of disease[10]. While humoral balance in the human body may not reign today as a prevailing theory, it was rational and empirical. Correspondingly, mental health was framed in the domain of witches and shamans while treated with exorcism and trepanation[11]. Although notions of id and ego may not frame modern theories of neuroscience, Sigmund Freud is regarded by many as introducing a coherent theory of mind and mental well-being[12]. In it, he reasoned about suppressed memories, latent experience, symbolism, and dreams to explain neuroses and "hysteria." Much like the shifting fluids of the four cardinal Hippocratic humors, Freudian psychoanalyses left ample room for interpretation. Nevertheless, Freudian theory introduced recognizable classes of mental illness, with a rich theory of causality that could be clinically mitigated through psychoanalyses. Mental health practitioners could awake to a dawn of systematic observation that could evolve to measurement, tabulation, inference, and in theory—decision support.

However, what we now characterize as a psychodynamic model of mental health was based deeply in theory with an emphasis on etiology rather than a medical model of manifestation and course. It seeks to explain psychopathology in terms of external factors mediated through unconscious memories and childhood experiences. Perhaps most concerningly, the underlying etiologic theories of Freudian psychodynamics are essentially unprovable[13] and thus violate basic principles of scientific methods.

Psychodynamic theories that are deeply bound to cultural and gender-role notions of normality, color Freudian psychology. While perhaps channeling the neurosis of *fin de siècle* Vienna, few today would argue that Freud's body of work generalizes for all times, places, and societies. Nor are the clinical records it generates well suited to enumeration, tabulation, or inference. As a framework for clinical informatics development, more substance was needed.

Phenomenological Characterization of Mental Illness

Syndromes as Diseases

If one cannot measure something, the next best thing is to describe it. The goal is to recognize it when one sees it again. So it is true with disease, or more properly, syndromes. Syndromes deriving from the Greek σὺνδρομον (concurrence) can be defined as diseases characterized by their manifestations. A common clinical example is heart failure. Heart failure can have many causes, infection, inflammation, toxicity, stricture, but most commonly infarction. Yet all these causal paths can have a common end-point of edematous extremities, pulmonary edema, and fatigue—even death—due to low cardiac output. In many cases, treating the symptoms—relieving the edema, clearing lungs, enhancing cardiac output—is the mainstay of clinical management; patients feel and live better. But in many cases, we are not treating the underlying cause of the heart failure. Diagnosing and managing clinical syndromes, even if clinical artifices in the end, can be practical.

A large fraction of mental health conditions are fundamentally syndromic. Depression, mania, schizophrenia, and personality disorders are virtually all defined by their behavioral manifestations. This does not make these constructs invalid, indeed they can be and are managed by mitigating those manifestations, much like congestive heart failure. However, unlike congestive heart failure, where one can measure pulmonary capillary wedge pressures and cardiac ejection fractions reproducibly and accurately, there are really no corresponding

physiological metrics for mental health syndromes. Thus, manifestations of signs and symptoms, and thus diagnoses, are ultimately subjective. It is this subjective nature of syndromic abstractions that most clearly separates classification and disease entities in mental illness from most other modes of medicine.

This subjective nature of syndromes also hampers mitigation strategies. If we understand that heart failure manifests as low cardiac output (we will conveniently ignore the relatively new syndrome of high-output heart failure), we can presumably "fix" the problem by increasing cardiac output. This is done pharmacologically, or in extremis though left-ventricular assist devices. The problem with depression, for example, is that we cannot increase a corresponding "happiness" flow to counteract it. Thoughtful readers will suggest that serotonin re-update inhibitors may be an analog to cardiac output enhancement, and they would be correct. However, from a mental-health classification perspective, we rarely treat "low serotonin" per se, but the more nuanced syndrome of depression. Nevertheless, this perspective will be considered in the section on Physiologic Pathways.

If the goal is to reproducibly and accurately recognize a mental health syndrome (or disease) we need to identify and formalize diagnostic criteria from observable manifestations. In other words, careful clinical observation has become critical to mental health nosology.

Descriptive Nosology

The mid-19th century witnessed a profound emergence of categorical psychiatric nosology that contrasted with the psychodynamic world view, presaging a "medical model" that emphasized a careful description of signs, symptoms, clinical course, and prognosis. Kahlbaum introduced an such an empiric classification in 1863[14] and laid the foundation for later diagnostic systems based on clinical criteria[15]. His work was embraced and expanded by a contemporary of Freud's, Emil Kraepelin. Kraepelin asserted that types of mental illnesses were "natural kinds" or "natural disease entities"[16]. As such, he believed that they could be characterized by consistent criteria, discovered through research; research that detected these criteria in contrast to psychodynamics which constructed them. However, rather than relying on the acute syndromic systemization of Kahlbaum, Kraepelin emphasized the clinical course and prognoses over the ephemeral signs and symptoms of mental conditions as the exclusive discriminating criteria for disease.

Kraepelin is particularly noted for his exquisite characterizations of manic depressive psychosis[17] as distinct from dementia praecox[18], later generalized as schizophrenia. This fundamental dichotomy in psychiatric thinking persists to the present day and is often called the Kraepelinian dichotomy[19]. Importantly, Kraepelin recognized that diagnostic criteria would change with advances in psychiatric research and technology; though the persistence of underlying natural kinds should persist. Nevertheless, his work became the foundation for the emergence of clear diagnostic criteria and algorithms in the late 20th century. However, with the mid-century rise of biological psychiatry presaging modern neuroscience, the focus on phenomenological criteria initially receded in the first wave of "denosologization" in psychiatric diagnoses.

The Emergence of the DSM

Classification of medical diseases in the modern era began in the early 20th century with the introduction of the multi-axial Standard Nomenclature of Diseases and Operations(SNDO)[2]. By the 4th Edition of SNDO in 1952[20], it included post-war diagnostic categories more closely matching 20th century America rather than Freudian Vienna. The first edition of the Diagnostic

and Statistical Manual of Mental Disorders (DSM-I)[21] corresponded to the mental health chapter of SNDO[22]. While modest in scope with 128 categories, the DSM series ushered in a long formalization of diagnostic criteria that profoundly impacted the practice and essence of psychiatric practice in the late 20th century.

DSM was unique in modern classification systems in that it was developed primarily to be clinically useful and to facilitate treatment and management. Psychiatrists would refer to DSM categories when discussing patients and their conditions, something that could not be said about internists and ICD or surgeons and CPT. DSM was used in teaching students, residents, and fellows in psychiatry, and employed heavily in psychiatric research. The very characteristics of the profession, for some period of time, was intertwined with the categories in the classification. While the academic field certainly defined the DSM, it is not a stretch to assert that to some degree the classifications also defined the field.

Colleagues at Washington University led effort to make DSM criteria more scientific, to that time they had largely been expert opinion. They invoked five phases for establishing data-driven criteria: clinical description, laboratory studies delimitation from other disorders, follow-up study, and family studies[23]. This work would become the most cited reference in the field for many years. Importantly, it birthed the application of multiaxial descriptions to psychiatry in DSM III. Disease descriptions were longer and including clarify differentia between conditions. However, most importantly DSMIII accelerated the reliance of practitioners on the classification, as summarized by Blashfield et al.[24]:

> The explanation for the revolutionary nature of the DSM-III extends far beyond the confines of what a classification does and is. Publishing the DSM-III was part of a paradigm shift in psychiatry (and the mental health field in general). Prior to the DSM-III, psychiatry was dominated by psychoanalytically trained psychiatrists who eschewed the ideas of Kraepelin. These psychoanalysts saw little value to clinical diagnosis for working with psychotherapy patients. In contrast, the main authors of the DSM-III were the leaders of a group that have become known as the neo-Kraepelinians.[22] Outcasts within American psychiatry during the 1950s and 1960s, these individuals took over the DSM-III. In doing so, the neo-Kraepelinians attempted to bring psychiatry back to its medical roots. … In effect, the neo-Kraepelinians, by creating the DSM-III, changed the entire focus of the mental health field.

The DSM in its later revisions did however create a de facto terminology of psychiatric signs, symptoms, findings, and conditions. We extracted a workable nosology of psychiatric terms and synonyms by breaking down the diagnostic criteria within the DSM IV[25]. We discovered latent descriptive language outside the primary rubrics that we called “criteria concept terms.” We lexically normalized these terms as words, retaining phrases where the meaning required. We mapped the terms and phrases to the UMLS Metathesaurus. The exercise created a robust nosology, preserving the relationships among DS rubrics, suitable for natural language processing of clinical text for psychiatric findings. It would seem plausible to create algorithmic coding suggestions from clinical notes with this lexicon associated with machinable algorithm rules.

Despite incremental elegance of these rich, descriptive systems for psychiatric diagnoses and the pragmatic successes of the neo-Kraepelinians and DSM, in reality the psychiatric community was still mostly working with shadows, the overt phenomenological manifestations of disease rather than any underlying biomedical causation. The field of neuroscience, blending

biochemistry with physiological pathways to examine behavior, exploded in the late 20th century and has accelerated ever since.

These problems were well recognized by the modern psychiatry community. Steve Hyman, a former NIMH director and chair the ICD11 Mental Health Topic Advisory Group (TAG) authored a critique of the DSM approach, including ICD11, in his "Diagnosing the DSM" editorial[26]. However, Hyman argued that "stubborn difficulties of the science" are more to blame for the persistence of phenomenological characterization of mental health disorders, and a failure to recognize or accept more holistic categories. Mental health rubrics in ICD11 also remain mostly phenomenological for the same reason. Thomas Insel while the subsequent permanent director of National Institute of Mental Health (NIMH) described that the real strength of these descriptive systems has been their reliability, but asserted that their weakness is their lack of validity[27]. The National Institute of Mental Health (NIMH) summarized the circumstances in 2010[28]:

> While the focus of this journey over the past 30 years has been on refinements in clinically based classification, the time has come to lay the groundwork for the next step in this process: incorporating data on pathophysiology in ways that eventually will help identify new targets for treatment development, detect subgroups for treatment selection, and provide a better match between research findings and clinical decision making.

It would seem that the world, and neuroscience in particular, was ready for progression beyond phenomenology.

Physiologic "circuits" as Basis for Disease

The "next step" promoted by NIMH introduced a new framework for conceptualizing mental health disease based on genomics and neuroscience, the Research Domain Criteria (RDoC) initiative[28]. The framework rests on three assumptions: 1) mental illness can be conceptualized as disorders of brain circuits; 2) these circuit dysfunctions can be identifies with the tools of modern neuroscience; and 3) data from genetics and clinical neuroscience can identify biosignatures that together with signs and symptoms will enable better clinical research and ultimately clinical management. The notion of neural circuitry is central to the RDoC framework, bracketed by clinical manifestations on the one side with genetic and molecular processes on the other.

The structure of RDoC includes six major constructs about brain circuits: Negative Valence Systems (e.g. fear, anxiety); Positive Valence Systems (e.g. reward seeking); Cognitive Systems (e.g. attention, perception, language); Systems for Social Processes (e.g. affiliation and attachment, social communication, perceptions of self and others); Arousal/Regulatory Systems (e.g. arousal, circadian rhythms, sleep); and Sensorimotor Systems (motor control, agency and ownership of actions, habit). These are widely acknowledged to align poorly with historical notions and categories of mental illness; the Kraepelinian dichotomy these are not. But they do align with what is emerging from neurophysiology and molecular understanding of behavior.

NIMH went further and announced in 2014 that all research funded by the institute must be framed using RDoC characterizations[27], though acknowledging that the system was not a clinical tool but only a research framework intended to develop a next generation diagnostic system. Insel characterized RDoC as psychiatry's equivalent to precision medicine, analogous to

deconstructing cancers by molecular signatures [29]. While there were few biomarkers for psychiatric illness in 2014, several promising developments have emerged since, particularly for dementias.

The real question is whether RDoC can evolve beyond a research framework to significantly influence diagnostic categories in psychiatric practice. There is an increasing realization that descriptive diagnostic rubrics do not correspond to biological pathways or behavioral systems. The belief that therapies and interventions based on neuro-physiology was likely be a future of psychiatry drove the RDoC framework for research. Physiological conditions discerned early in life may enable early interventions that forestall development of fully established mental health conditions. Thus, it is argued, diagnostic categories should increasingly focus on these prodromal conditions at their earliest detectable stage, ideally far removed from the final syndromic manifestations where it may be too late to intervene but only manage the consequences[30].

Approaches to Mental Health in ICD-11

Throughout the development of the Mental Health chapter of ICD-11 has been to prioritize the clinical utility of the classification[31]. The mental health chapters of ICD since the emergence of ICD10 have advanced clinical utility by developing Clinical Description and Diagnostic Guidelines for Mental and Behavioral Disorders that exist outside the framework of WHO published ICD tabulations, often referred to as the Bluebook[32]. These highly detailed characterization of each rubric expand at length on the rational and application of ICD mental health rubrics, and are intended to disambiguate and clarify their application in clinical practice. ICD11 developed standardized templates called a "content form" to create more coherent and uniform structure for the adaptation of these guidelines from previous editions[31]. How generalizable the clinical utility of the ICD11 update of these guidelines was to a broader community was systematically explored in broad field spectrum of international evaluations[33] including surveys, formative field studies of clinician conceptualization, and case-control field studies exploring the impact of proposed changes to the guidelines[34]. The core strategy for improving the utility of ICD11 and the corresponding Clinical Description and Diagnostic Guidelines was to "align them with how clinicians conceptualize psychopathology in practice."[35]

These changes and innovations are most comprehensively summarized in a 2019 Special Article in World Psychiatry to Reed et al.[36] who emphasized the goal of global applicability in addition to clinical utility. They assert the development of the Mental Health components of ICD11 "has been "the most broadly international, multilingual, multidisciplinary and participative revision process ever implemented for a classification of mental disorders." The working groups within the Mental Health TAG incorporated rigorous reviews of the scientific literature and associated evidence to maximize the scientific validity of the underlying concepts and rubrics. They sought to identify the essential features of each disorder likely to be found in all cases. This deliberately eschewed the historical reliance counts, cutoffs, and similar quantitative criteria deployed in DSM IV and to some extent in ICD10. This emphasis on essential characteristics was found to conform more closely to how clinicians actually make diagnoses[37].

ICD11 also adopted a "lifespan" approach mental health conditions, moving away from an historical practice to distinguishing childhood from adult conditions when in many cases they are manifestations of the same underlying psychopathology over different life stages. There was

also tremendous sensitivity to cultural influences on mental health psychopathology, with significant efforts to address the underlying essential features of disease categories[38-44]. Finally, the characterization of ICD11 mental health conditions incorporated dimensional approaches that spanned and integrated a number of interacting symptom dimensions across categorical systems[45]. The dimensional approach had the greatest impact on the classification of personality disorders[46].

No health classification has true utility unless it can be demonstrated that it is reproducible and effective. Although ICD11 has only recently been released, it has enjoyed substantial evaluation through field studies in its development[47-50]. These studies did highlight that ICD11-specific training will be needed, though overall the performance was demonstrably better than ICD10[51]

Case Examples of Mental Health Concept Consideration in ICD11

ICD has cataloged not only "disease," but also signs, symptoms, syndromes, and health related conditions – not all of which are regarded as disease pathology. Nevertheless, there has been substantial historical stigma associated with rubrics included in the Mental Health chapter. The most dramatic and carefully considered example of concept evolution about historically "mental health" concepts are concepts related to sexuality and gender identity[52]; the development of ICD11 recognized the substantial "major shifts in social attitudes and in relevant policies, laws, and human rights standards" that has occurred in the 30 years since the development of ICD10. ICD10 was based on a simplistic separation of mental health diseases into organic and non-organic conditions; sexual health issues were categorized as non-organic. ICD11 acknowledges a more realistic interaction of physical and psychological factors impacting human response and conditions.

These recognitions have resulted in the creation of a new ICD11 chapter on Conditions Related to Sexual Health, disjoint from Mental Health conditions. As a consequence, many conditions have literally been removed from the category of mental health issues. Prominent among this is the historical Mental Health condition of Gender Identify, which is now more neutrally rendered as Gender Incongruence in the Sexual Health chapter. Correspondingly, transgender identity has been removed from the ICD altogether, as scientific evidence for it being regarded as psychopathology is absent in our current climate of understanding about human beliefs around normality. On the contrary, there is growing evidence that this stigmatization of characterizing transgender identity as a disease is socially and psychological harmful[53].

A more recent example was the reconsideration of Parental Alienation syndrome. It is objectively a circumstance where one parent systematically attempts or succeeds in having shared children harbor negative thoughts and feelings for the other parent. It was added as an "index term" to rubric QE52.0 Caregiver-child Relationship Problem, though not as a first rank, coded entity. Many people involved in child safety were alarmed by this, as the claim of parental alienation is often used in divorce legal proceedings in a manner to mitigate arrangements and divorce awards from what they would otherwise be. The pure political nature of the problem, and the very large advocacy community in favor of eliminating the term had consequences. The Medical and Scientific Advisory Committee (MSAC), after months of research and deliberation made a recommendation to WHO that the term be retained only in the Foundation, which would allow it to remain as an index term. To acknowledge potential inappropriate use, that Foundation entry would include a note that the WHO does not endorse the use of the term for any purpose other than an objective description of one parent imparting

negative feelings about the other parent to shared children. MSAC decision are advisory, and WHO is not bound to follow them. In the end, the advocacy community, including many branches to WHO itself, succeeded in having the term and phrase removed from the ICD entirely.

Conclusions

Informatics in mental health can serve many roles. However, the definition of underlying mental health conditions, their phenotype in data science terms, have evolved remarkably over time. While distinguishing who does or does not have a condition of interest is central to any data management or analyses around that condition, mental health is unique in its potential for profound informatics contribution to etiologic characterization. If we consider the current paradigms of mental illness something akin to "end stage disease," the goal is obviously to find predictors of those conditions early in the course of a broader spectrum of these diseases. Informatics can and should play a role in such discovery, partnering in the best traditions of translational research with neuroscience and clinical colleagues. We are at an exciting time for concept representation in mental health conditions, primed to move their characterization based on omics and pathways beyond a research framework to practical, clinical rubrics.

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