Heintz, McKeever, Reimer, Schoof
Dr. Anne Reilly
BHNR 353
9 December 2021

# Wellness in the Workplace: An Analysis on the Office Environment and Mental Health in Chicago and NYC

## Abstract

Professionals in America spend five days a week, an average of 40 hours, in an office environment. These same people tailor their homes to be comfortable oases that inspire happiness, but is this same effort being made for these office spaces they somewhat call home especially after the COVID-19 pandemic? The question our team set out to ask is as follows: *Should companies prioritize investing in better working environments with a focus to increase employee wellbeing and mental health?* We use New York City and Chicago as subjects in our analysis to find a relationship between building aesthetics and employee wellbeing/mental health. Using WELL-certified square feet per resident, substance abuse, mental illness, happiness, and stress statistics, we paint a picture of how the work environment affects employees through a multi-method approach. Starting with the empirical analysis, we found two statistically significant correlations, however, these are not intuitive and in line with our literature review. Our normative analysis led to actionable insights surrounding the design of office spaces to benefit employees.

## I. Introduction

The average American works 7.6 hours per day, 5 days a week, totaling over 1900 hours per year (*American Time Use Survey,* 2021). Such a statistic makes it clear that the majority of a person's waking hours are spent at their place of work and inevitably impacts a person's wellbeing. Regardless of long work hours, it is also estimated that one in every five U.S. adults

lives with a mental illness. As of 2019, that affects 51.5 million people out of the American population (National Institute of Mental Health, 2019). Mental illnesses are widespread. The NIMH categorizes mental health into two categories: 1. Any mental illness (AMI) which means a "mental, behavioral, or emotional disorder" and 2. Serious mental illness (SMI) is defined as the same but results in "serious functional impairment, which substantially interferes with or limits one or more major life activities." Based on studies conducted by Mental Health America (MHA), 19% of U.S. adults are experiencing a mental illness with 4.6% experiencing SMI. New York (#7, 18%) and Illinois (#4, 17%) are both ranked within the top ten states with a significant adult prevalence of AMI (MHA, 2020). As stated by New York State's Department of Health, the "disease burden or total cost of mental illness exceeds that caused by all cancers." It is important to note such serious implications as mental illness can be the outcome of a poor and insufficient work environment (NY Department of Health, 2021).

A work-life balance is commonly spoken of in the workforce but businesses could be overlooking their work environment as to whether it facilitates having an impact on employee wellbeing. Through an analysis of 50 papers, a literature review concluded that office environments that encourage physical activity (i.e., including sit-stand and bike desks) and increased distances to communal facilities, are found to have a positive correlation with physical wellbeing (Colenberg, Susanne., et al.). It is much easier for businesses to adjust the interior environment of a building than the architecture, making such negative effects on worker health easier to reduce.

Our research looks to address how the buildings specifically impact the wellbeing and mental health of working professionals in two of the most densely populated American cities: Chicago and New York. We look to address *if companies should prioritize investing in better*

*physical working environments with a focus on increasing employee wellbeing and mental health.* We conducted an empirical analysis to find the relationship between a building's physical environment/aesthetics and employee wellbeing within these two cities. Our office setting data will be derived from buildings with WELL certifications and the measurement of WELL square footage per person in each city. To measure mental health, we will look at the Happiness Index and Stress Index. To measure wellbeing, we will look at substance abuse and AMI data. Our study will see if these factors have an impact and what factors companies should invest in when building and remodeling their office spaces to improve wellness and mental health.

As soon-to-be college graduates, evaluating the current state of a work environment and how it may affect a professional's wellbeing is important to us as we will be joining the workforce soon. The main goal of our study was to conduct exploratory research by synthesizing existing data with the hopes of providing a reference point for future studies. Our research will provide normative implications on the workplace environments and how they could be better designed for increased overall employee wellbeing. Our research question will be addressed through empirical and normative analysis providing an opportunity to show the trends of office spaces across America, especially after the COVID-19 pandemic.

## II. Literature Review

### *Your Environment and Mental Health*

Because of the significant number of hours an individual spends at their place of work, recent research has begun to look at how these spaces impact employee wellbeing. A study from Gensler Research Institute in 2013 found that:

> "The design of physical space has far-reaching effects on human wellbeing. Connections to nature, intuitive navigation, and spaces that support activity and engagement are key attributes of wellness-based environments," (Bouza, Kraus, et al. 2013).

According to this study, incorporating elements of nature into building design directly affects mental health, and has even been linked to more rapid and effective healing in healthcare environments (Bouza, Kraus, et al. 2013). This study also examines how building design can facilitate human interaction which supports "positive emotional states that have been linked to better health, longer life, and greater overall well-being" (Bouza, Kraus, et al. 2013). Communal spaces that promote conversation and collaboration lead to more positive interaction among employees, whereas office environments with secluded spaces encourage more time spent in isolation which harms wellbeing and mental health when experienced daily.

Research has even been done to study how the colors used in office design can impact employee wellbeing. One study published in the *South African Journal of Economic and Management Sciences* concluded that "colour shows significant moderating effects on Work Stress and Knowledge Sharing" (Hsiao, Luke, et al. 52). Work stress and knowledge sharing, or collaboration and communication, then have a significant impact on employee happiness and mental health.

Lastly, one other study that looked at the connection between office characteristics and employee health concluded, "office space occupation, satisfaction with environmental features of the workplace, and psychosocial work characteristics were found to be associated with employee health and job satisfaction" (Herbig, B., et al. 762). These three studies demonstrate that the connection between office design and employee mental health is observable and significant, and there are concrete elements that can be used to promote wellbeing and health.

***Mental Health/Wellbeing and Productivity in Workplaces***

To be productive, it is vital for an employee's basic needs to be met. Basic needs dictate the worker's wellbeing. For an office space, the physical environment should have an adequate

temperature, lighting intensity, noise level, and be free from hazards. Productivity decreases when these factors change. For example, 4,479 workers took a questionnaire studying environmental conditions, concluding that:

> "(W)orkers were asked to indicate how much their work had been disrupted by each of the environmental conditions (too warm or too cold), inadequate ventilation, distracting noise, and glaring lighting was the most disruptive to work," (Barling, Julian., et al. 229, 2005).

This self-reported data is still relevant to see what conditions are critical for a worker's wellbeing. Companies want to ensure that their workers are satisfied to increase worker productivity and keep employee retention high.

Also, employees with mood disorders affecting mental health make up a larger population than one might assume. "It is well-known that mood disorders cause the largest disease burden in general population and loss of work productivity in the working population," (Postolache, Teodor T., and Joav. Merrick 336, 2010). Specifically, depressive episodes have impacted presenteeism and absenteeism:

> "Depressive episodes resulting from work-related stress can impact vocational performance by 'presenteeism' (reduced work productivity while present at work) due to decreased concentration, reduced motivation, and decision errors, as well as 'absenteeism' (lost productivity from an absence, e.g. non-attendant workday, arriving late or leaving earlier than usual)," (Postolache, Teodor T., and Joav. Merrick 337, 2010).

By using a multi-method approach, findings show that unprejudiced attention to treating employees with mood disorders and treatment of depression has been significantly beneficial for decreasing presenteeism and absenteeism (Postolache, Teodor T., and Joav. Merrick 350, 2010). Investing in employees should be done not only to increase productivity but also to create a culture that prioritizes wellbeing.

***COVID-19 and Return-to-Work***

COVID-19 shifted most computer-based office work to a virtual setting and most companies are struggling to get their people back in the office. In a study by the McKinsey Global Institute, they found that "The computer-based office work arena … is the largest arena in advanced economies, accounting for roughly one-third of employment. Nearly all potential remote work is within this arena," (Lund et al., 2021). Because so many employees are facing a large shift in work-life, companies will be forced to address new desires within the workplace. Maslow's hierarchy of needs affirms this desire from employees. Displayed in Figure 1, Maslow finds these needs must be met and are listed by importance: Psychological needs, safety, love and belonging, esteem, and self-actualization (Maslow, 1943). If one company chooses not to accommodate these needs, another surely will, and employees change jobs now more than ever.

Using surveys, the Gensler Research Institute has identified trends that drive the post-pandemic workplace. For example, the first trend seen in this study is the need for mobility. Mobility is the ability to work remotely along with the autonomy to match work to the appropriate setting (McLaurin, 2020). Gensler also finds that "(T)hose in a 'hybrid model,' … appear more deliberate with how they use their time, have better awareness of what their colleagues are working on, and have higher job satisfaction overall," (McLaurin, 2020).

While awareness of other people's work is now preferred in the remote environment, Gensler has found that there is a clear trend pointing to a preference for privacy that could be found at their home offices. One way to accommodate this need is to provide openness in the office space for workers to spread out where they choose. While this may seem contradictory, open office spaces allow employees to sit alone when needed and socialize when preferred. It can also mitigate tension between two individuals via easy separation. Collaboration is still

important to the working environment but is more effective when workers get to choose when to interact. Gensler comments on this idea of openness, stating that:

> "In 2019, we created a 'degrees of openness' scale to measure workers' total work environment, ... We found that 'mostly open' workplaces were associated with higher performance and greater experience, but noise, privacy, and the ability to focus remain key determinants of workplace effectiveness," (McLaurin, 2020).

The final trend that Gensler identifies is the need for more health and wellbeing resources. While other studies discuss this further, companies must consider health and wellbeing in everything they do.

## III. Methods

To begin our methods and approach, it is crucial to define terms surrounding our study. Table 1 further provides clarity for our variables and how that data was collected. We performed a comparative analysis using data from New York City and Chicago as subjects. We pulled population data from the 2019 National Census for each city and further narrowed the population numbers down to working-age adults (18 and older). We isolated this group as they are the ones most likely to be working in any type of office building. While this will not account for the retired population, mental health statistics are reported this way, and narrowing the ages to 18+ years old will allow for consistency. Table 2 relates to state, county, and city populations between Illinois and New York City.

Next, we analyzed WELL data from their current online directory of projects to determine the total number of WELL buildings and square footage certified for commercial use in each city. We chose to use WELL data because of the rigorous requirements of buildings bearing this certification. Because every WELL building is required to meet all of the outlined preconditions under 10 concepts with the option to optimize further for higher levels of certification, we feel confident that this data is standardized and optimal for our research. By

using WELL buildings in our study, we can ensure that employees in these spaces experience an array of structural and interior design elements aimed at improving wellbeing. This means we can potentially deduce a level of efficacy in regards to improving wellbeing from the standardized design elements. Building certifications such as LEED have been shown to be an easy way to compare a building and WELL is similar. These numbers were then broken down into WELL square footage per city resident using the information from Table 2. To gain a clearer understanding of the requirements that a building must meet to be granted a WELL certification, see Table 3.

For measuring mental health, we looked specifically at substance use disorders and reports of "any mental illness" (AMI). We felt these two measures gave the most comprehensive view of mental health on a population level with publicly accessible data published in 2019. Both of these measures are reported as a percentage of the state population rather than the city population. However, we felt these measures were still acceptable to use in our city-based comparison based on the fact that our subject cities make up roughly 40% of our subject populations. Specifically, Cook County, which includes Chicagoland and the surrounding area, makes up 41.3% of Illinois population, and the five boroughs of New York make up 42.6% of New York State. Having these figures, which were reported by a national standardized entity, gave us a clear comparison between the two cities. To further measure wellbeing, we included the Happiness Index and Stress Index for each city which we pulled from studies conducted by independent research organizations (The American Psychological Association and The World Happiness Report).

From there, we utilized a correlation matrix to find connections between the different mental health and wellbeing factors as well as WELL square footage per adult city resident

(Table 6). We also calculated P values to determine if there was any statistical significance in our data (Table 7). It is important to note that the sample size used in this analysis was three; Chicago, New York City, and the Nation, which may lead to insignificant statistical results, however, our goal was to find indicative patterns. Once we completed the correlation, we compared our findings to the qualitative data gathered in the literature review to draw conclusions and recommendations. This segment of our research was comparative and exploratory and resulted in a synthesis of new and existing quantitative and qualitative research.

## IV. Results

Overall, the research was to discover *Should companies prioritize investing in better working environments with a focus to increase employee wellbeing and mental health?* We synthesized previous data and ran a correlation test based on the variables we chose. The Happiness Index and Stress Index measured wellbeing. On the other hand, AMI data and substance abuse data measured mental health. For office spaces, WELL-certified office spaces per person measured the office conditions. P-values less than 0.05 took more importance compared to the correlations that were greater than 0.95. The correlation data did not show what we anticipated. A correlation matrix (Table 6) shows the correlation between substance abuse, AMI, the Happiness Index, Stress Index, and the WELL-certified office space. Table 7 shows that only two significant p-values were found, and they were for correlations we did not expect. The correlation matrix and p-value table show numbers rounded to three decimals. Our findings show that Chicago is happier, more stressed, and has more WELL-certified office space compared to New York City.

The variables we chose to represent mental health did not show a high correlation between each other. Again, these variables were substance abuse, AMI, and the stress index.

Surprisingly, a strong negative correlation of -0.983 was found between substance abuse and AMI but did hold a significant p-value (Table 6). Illinois reported more substance abuse compared to New York, 8.32% and 8.04% respectively (Table 5). On the other hand, New York reported more AMI compared to Illinois, 17.61% and 16.76% respectively (Table 5). The strong negative correlation is contradictory to popular belief that substance abuse will lead to AMI.

Surprisingly, substance abuse is strongly positively correlated with WELL square footage per person at 1.000 (Table 6). Also, this was one of the two correlations with a significant p-value of 0.018 (Table 7). We did not expect a positive correlation between a hindering variable and a wellness building. From Table 4, Chicago has a higher percentage of WELL-certified office space at 29.09% compared to New York City, which has 28.15% of WELL-certified office space (Table 4). After factoring in the population data, Chicago has more WELL square footage per worker at 31 sq ft compared to New York which only has 19 sq ft (Table 4). Compared to the United States as a control variable, both Chicago and New York City have more WELL square footage per worker. Because AMI and substance abuse is negatively correlated, this also means that AMI and WELL square footage per person formed a strong negative correlation of -0.97 but with an insignificant p-value (Table 6). The Stress Index did not have a high correlation over 0.95, except for its correlation to the Happiness Index at 1.000 (Table 6). This infers that having more stress is correlated with more happiness. Equally unexpected, the Stress Index and Happiness Index produced the lowest p-value of 0.005 (Table 7). Illinois outranked New York and the national data by being rated 7.033 for the Happiness Index and 5.6 for the Stress Index (Table 5). Although the Stress Index was positively correlated with the WELL square footage per worker, the p-value and the correlation were not significant. The strong positive correlation between substance abuse and WELL square footage per person went against the hypothesis.

Contrastly, the correlation between the Happiness Index and WELL square footage per worker partially supported the hypothesis by having a strong positive correlation of 0.950, but did not have a significant p-value (Table 6). The findings from our literature review support our hypothesis but differ from our sample. Our data showed unexpected results of substance abuse positively correlating with WELL spaces and the Happiness and Stress Indexes positively correlating. The other correlations produced no findings because the p-values were not significant and we needed more data to draw a correlation.

## V. Discussion and Interpretations

Upon the conclusion of our research data results, we were surprised to find that our literature review sources proved to be a better outcome of our research question compared to our statistical results. Due to the small sample size of available public mental health and WELL information that was accessible to us, our correlations with a p-value less than 0.05 to not be as indicative. In the correlation matrix between WELL space and mental health factors (Table 6), AMI and WELL square footage per person formed a strong negative correlation of -0.983 but with an insignificant p-value. Despite this negative correlation, our results showed two significant positive correlations between 1) WELL square footage per person and substance abuse (p-value: 1.000) and 2) WELL square footage per person and stress index (p-value: 0.950) (Table 8).

In our statistical analysis, Chicago proved unintuitive results to be a happier work environment, but a higher stress environment compared to New York (Table 5). Such results are a bit counterintuitive but this table only focuses on the reported population of these two variables and not other extraneous factors. Additionally, even though Chicago has more WELL square footage per person and is positively correlated with stress index, the p-value and the correlation

are not significant to conclude that WELL-certified spaces impacted Stress Index. Further research could correlate such wellness information evaluating substance abuse, Stress Index, Happiness Index, and AMI strictly from the employees who inhabit those workspaces to possibly have a more significant p-value.

While our statistical results were not all significant, we believe that there is still a clear argument to be made as to why corporations should invest in their workspaces. Mental health issues and office spaces are not specific to Chicago and New York City. They occur everywhere. If we had the time and data resources to construct a data set using the 20 largest cities in the United States, we might have been able to draw stronger correlations between WELL spaces and mental health/wellbeing. Our literature review immediately confirmed our research predictions that there is real value in investing in spaces for the sake of employees. A Gensler study found that the design of a working environment has an observable and significant impact on employee well-being (Bouza, Kraus, et al. 2013). Postoloche et. al. found that a significant factor hindering productivity in workplaces is the high number with a mood disorder (2010). While our correlation between WELL square footage per person and reporting AMI (-0.978) was not significantly significant, that is not to say that adding more samples in further research would not make it so and this correlation may still be indicative of a trend. Much research has been done connecting spaces to the wellbeing of those in those spaces, especially schools and offices.

The pressure for corporations to take this step could not be any greater given the work environment caused by COVID-19. People feel as though that their homes are better equipped to meet their needs. Maslow's hierarchy of needs states that there are five crucial levels of needs that need to be met (see Figure 1). While the work-from-home environment makes it difficult to meet the need for belonging and some factors of self-actualization, those environments are easier

to manufacture outside of the workspace. If corporations expect their employees to return to work, as their European counterparts have done, then these investments must be made and needs are met (Rogers, 2021). As Dan Price, the founder and CEO of Gravity Payments, once said "How come CEOs get million-dollar bonuses for reaching their goals while workers get a pizza party?" (Price, 2021). Employees are watching where money is being allocated and if more is not directed towards them quickly, American office culture will cease to exist.

## VI. Conclusion, Implications, and Recommendations

### *Implications & Recommendations*

The implications of this study impact decision-making in a few key areas for both businesses and individuals. First, based on the data and connections drawn in the literature review, we recommend that businesses with office space invest in designing spaces and buildings that promote wellness. The most desirable option is building WELL-certified structures that fulfill the air, water, nourishment, light, fitness, comfort, and mental requirements. Our research confirms that these categories enhance the mental and physical wellbeing of employees which leads to higher productivity, decreased absenteeism, greater workplace cooperation, and in turn, higher profits. While we cannot quantify the financial returns that investments into healthier buildings can potentially produce, our research still demonstrates that these investments can benefit a company's culture, efficiency, and bottom line. During a time when businesses are struggling to motivate employees to return to the office, investing in spaces that promote productivity and wellbeing can be a powerful draw. Now more than ever, businesses have the need and opportunity to make investments in their spaces; employees can work from home during construction, and new facilities can lure employees back to the office facilitating communication and strengthening culture.

This study may also inform personal decision-making for individuals in the job market choosing where to work. Our research suggests that there is a connection between building design, specifically the characteristics set forth by WELL, and overall wellness. This may be especially relevant for people who already struggle with mental illness and want to make life decisions that promote mental health. As an increasing number of individuals prioritize building design in their career decisions, more businesses will feel the pressure to invest in quality spaces to attract top talent. Therefore, individuals using building design as job criteria can, in turn, lead to the construction of more WELL-certified buildings or buildings that implement some of the WELL standards.

Lastly, while conclusions drawn in our research are limited, these findings may be used as a point of comparison for future research. In general, corporate offices are currently still unsure of what the future of work will look like. Coming out of the pandemic, where office jobs transitioned to remote work, many businesses have not decided whether they will fully return, stay remote, or use a hybrid model. Our research can be used as a point of comparison for future research to determine how investments in wellness-focused building design impact employees that did return to the office.

### *Limitations*

To create more significant findings, variables with higher correlations and p-values need to show a relationship between office spaces, mental health, and wellbeing. Confounding variables were difficult to remove and our variables were limited. For example, company culture can enforce a high-stress work environment but operate in a WELL building. The WELL data was limited because the residents of WELL buildings are nondisclosed. We did not have access to the names of companies that had high-stress work environments and operated within WELL

buildings. Also, we could not include commuters in our population calculation of WELL-space square footage per worker, because we did not know the number of workers who commute to WELL buildings.

Also, the findings would be improved by having access to more data. Although the data sets used did not have gaps in past years, the WELL data only shows the current amount of buildings registered and does not filter by year. For the mental health data, cities stopped reporting the data or were not specific with classifications. In addition, there was only statewide mental health data. People who live in the city could have different mental health conditions compared to people who live in rural areas. The mental health data could not be filtered for people who work in office spaces, so the data was taken from the average range of the working population. We needed more WELL spaces in different cities to find a stronger pattern between buildings and wellness. We needed a data set more specific to our research and contained city data, which was either private or unavailable to us.

***Future Research***

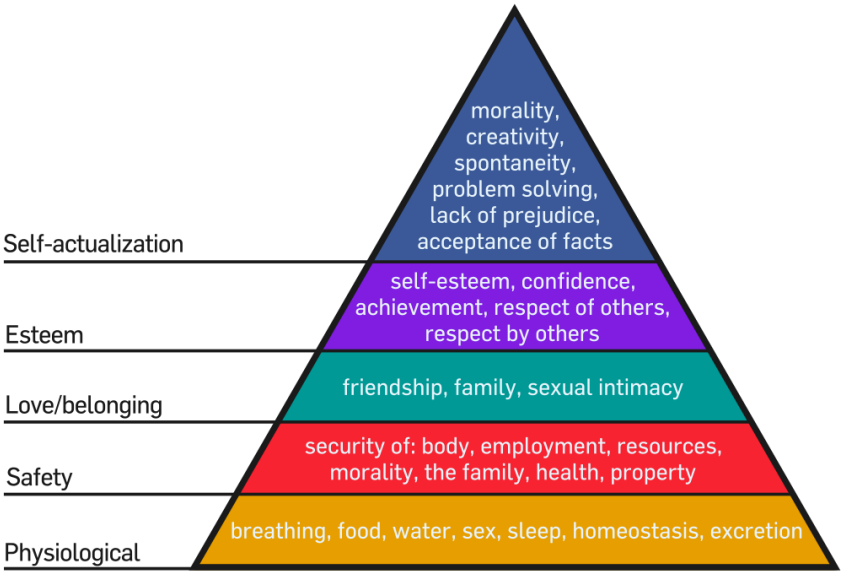
For future research, a stronger comparison and correlation could be drawn if data could be recorded from a company that operated within Chicago and New York City had WELL office spaces. A stronger correlation would exist between office spaces, mental health, and wellbeing by controlling more variables. Also, it would be useful to research our topic in other cities within the United States and internationally. Our WELL data set would have benefitted from a sample that reflected the United States. Access to aggregated mental health data would also improve our measures of mental health.

Despite the investment in WELL-certified offices, the shift in the workforce from COVID-19 has caused more people to work from home. As workers slowly return to the office,

possible office reconfigurations could be conducted for COVID-19 regulations or downsizing. Our research opens more of a conversation focused on creating a stronger correlation between office spaces, mental health, and wellbeing and seeing the impacts of COVID-19 on office spaces.

## Appendix

Figure 1: Maslow's Hierarchy of Needs (Graphic created by Ben Thompson)(Maslow, 1946)




| Table 1: Defining Variables | |
|---|---|
| Term | Definition |
| WELL | WELL is the leading tool for advancing health and well-being in buildings globally. (https://www.wellcertified.com/) |
| Working-age | For the purposes of this paper, a working-age person is any individual over 18 years old. See Table 3 for the latest WELL standards |
| Commercial office space | any commercial property that offers one or more rooms suited to a business performing office-related or administrative duties |
| Substance abuse disorder | Adults reporting a substance abuse disorder within the last year |
| Any mental illness | Adults with any mental illness |
| Happiness index | Resulting from the Gallup World and US Poll evaluating current life measurements |

| | |
|---|---|
| Stress index | Resulting from the Stress in America survey |

Table 1 defines important variables relating to our WELL, population, and mental health data.

| Table 2: City Populations as a Fraction of State and County Populations | | |
|---|---|---|
| | Illinois | New York |
| Total state population (millions) | 12.6 | 19.5 |
| Total city population (millions) | 2.7 | 8.3 |
| County housing major city population (millions) | 5.2 | N/A |
| % of state population that lives within city | 21.43% | 42.56% |
| % of state population that lives within major county | 41.27% | N/A |

Table 2 describes the relationship between the city populations and their respective county and state populations. This shows that both cities make up a relatively large portion of the state population, meaning that statewide mental health data can be applied to the individual city. It is important to note that the population of New York City is an aggregate of the five Borough populations, omitting the need for further county-wide data. (U.S. Census, 2019)

| Table 3: WELL v2 Conditions | |
|---|---|
| All buildings must meet the universal preconditions to qualify, however, there are additional optimizations that can be made to gain "points" for a space. These further optimizations can be found at https://v2.wellcertified.com/v/en/concepts. | |
| Concept | Universal Precondition to Qualify |
| Air | Fundamental Air Quality: Ensure a basic level of indoor air quality that contributes to the health and well-being of building users. |
| | Smoke-Free Environment: Deter smoking, minimize occupant exposure to secondhand smoke, and reduce smoke pollution. |
| | Ventilation Effectiveness: Prevent indoor air quality issues through the provision of adequate ventilation. |
| | Construction Pollution Management: Minimize the introduction of construction-related pollutants into indoor air, remediate construction-related indoor air contamination for human health and protect building products from degradation. |
| Water | Fundamental Water Quality: Limit the presence of sediment and water-borne bacteria levels in water for human contact. |
| | Water Contaminants: Provide access to drinking water that complies with health-based limits on contaminants. |
| | Legionella Control: Establish an effective management program that prevents or adequately controls the risk of exposure to Legionella bacteria. |

| | |
|---|---|
| Nourishment | Fruits and Vegetables: Promote the consumption of fruits and vegetables by making fruits and vegetables easily accessible. |
| | Nutritional Transparency: Help individuals make informed food consumption choices through nutritional labeling and information. |
| Light | Light Exposure and Education: Provide access to indoor light exposure and light education. |
| | Visual Lighting Design: Provide visual comfort and enhance acuity for all users through electric lighting. |
| Movement | Active Buildings and Communities: To promote movement, physical activity, and active living through the design of built spaces. |
| | Visual and Physical Ergonomics: Reduce physical strain and injury, improve ergonomic comfort and workplace safety and general well-being through ergonomic design and education. |
| Thermal Comfort | Thermal Performance: Ensure that the majority of building users find the thermal environment acceptable. |
| Sound | Sound Mapping: Incorporate strategic planning and mitigation required to prevent general issues of acoustical disturbance from both externally and internally generated noise. |
| Materials | Fundamental Material Precautions: Reduce or eliminate human exposure to building materials known to be hazardous. |
| | Hazardous Material Abatement: Reduce or eliminate human exposure to hazardous material ingredient byproducts from renovation, repair, or demolition work. |
| | Exterior Materials and Structures: Mitigate environmental contamination and associated hazards resulting from treated outdoor structures and wood-plastic materials. |
| Mind | Mental Health Promotion: Promote mental health and well-being through a commitment to mental health education, programming, and initiatives. |
| | Access to Nature: Support occupant well-being by incorporating the natural environment through the interior and exterior design. |
| Community | Health and Well-Being Awareness: Promote a deeper understanding of factors that impact human health and well-being. |
| | Integrative Design: Facilitate a collaborative development process and ensure adherence to collective well-being goals. |
| | Occupant Survey: Establish minimum standards for the evaluation of the experience and self-reported health and well-being of building occupants. |
| Innovations | None, only optimizations |

Table 3 provides definitions of the requirements for a building to attain a WELL v2 certification. WELL v2 is the latest certification edition from WELL and the most common certification. (WELL, 2021)

| Table 4: Population in Relation to Population, Chicago vs. New York City | | | |
|---|---|---|---|
| | Chicago, IL | New York City, NY | United States |
| Total population (millions) | 2.70 | 8.30 | 328.2 |
| Working age (18+) population (millions) | 2.14 | 6.57 | 255.0 |
| Square footage of commercial office space | 229,488,816 | 451,000,000 | 4,100,000,000 |
| Number of WELL-certified buildings | 324 | 544 | 17,295 |
| Total WELL-certified square footage | 66,752,102 | 126,947,720 | 1,254,436,590 |
| Percentage of office space that is WELL-certified | **29.09%** | 28.15% | 30.60% |
| WELL square footage per worker (not including commuters) | **31** | 19 | 5 |

Table 4 provides population data for each city and how that population relates to WELL-certified spaces. Bolded figures indicate the higher value between the two cities for items intended for comparison. (U.S. Census, 2019)(WELL, 2021)

| Table 5: Mental Health and Wellness Across Chicago and New York City | | | |
|---|---|---|---|
| | Illinois | New York | United States |
| % of those 18+ years old with: | | | |
| substance use disorder (2020)** | **8.32%** | 8.04% | 7.68% |
| any mental illness (AMI) (2020)** | 16.76% | **17.61%** | 19.86% |
| Happiness index (2020) (scale from 1-10) | **7.033** | 6.964 | 6.94 |
| Stress Index (2011) (scale from 1-10)*** | **5.6** | 5.3 | 5.2 |

Table 5 provides mental health data for both cities and nationally. Bolded figures indicate the higher value between the two cities for items intended for comparison. (NIH, 2020)(World Happiness Report, 2020)(American Psychological Association, 2011)

| Table 6: Correlation Matrix of WELL and Mental Health Factors (Correlations > 0.95 Bolded) | | | | | |
|---|---|---|---|---|---|
| | Substance abuse | AMI | Happiness Index | Stress Index | WELL per person |
| Substance abuse | 1.000 | **-0.983** | 0.941 | 0.938 | **1.000** |
| AMI | | 1.000 | -0.864 | -0.860 | **-0.978** |
| Happiness Index | | | 1.000 | **1.000** | **0.950** |
| Stress Index | | | | 1.000 | 0.948 |
| WELL per person | | | | | 1.000 |

Table 6 shows a correlation matrix between WELL space and mental health factors. Bolded figures show correlations greater than 0.95, indicating the most importance. We rounded our correlations to three decimal points.

| Table 7: P-Value of Correlation Matrix (P-value < 0.05 Bolded) | | | | | |
|---|---|---|---|---|---|
| | Substance abuse | AMI | Happiness Index | Stress Index | WELL per person |
| Substance abuse | | 0.117 | 0.219 | 0.225 | **0.018** |
| AMI | | | 0.336 | 0.341 | 0.134 |
| Happiness Index | | | | **0.005** | 0.202 |
| Stress Index | | | | | 0.207 |
| WELL per person | | | | | |

Table 7 shows the P-values associated with the correlations from Table 6. Bolded figures show P-Values less than 0.05, indicating significance. We rounded our p-values to three decimal points.

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