UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

Form 10-Q

☒ **QUARTERLY REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the quarterly period ended March 31, 2021

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the transition period from to

Commission File No. 001-36847

Invitae Corporation

(Exact name of the registrant as specified in its charter)

Delaware	**27-1701898**
(State or other jurisdiction of incorporation or organization)	**(I.R.S. Employer Identification No.)**

1400 16th Street, San Francisco, California 94103

(Address of principal executive offices, Zip Code)

(415) 374-7782

(Registrant's telephone number, including area code)

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	**Trading Symbol**	**Name of exchange on which registered**
Common Stock, $0.0001 par value per share	NVTA	New York Stock Exchange

Indicate by check mark whether the registrant: (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☒ No ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company" and "emerging growth company" in Rule 12b 2 of the Exchange Act.

Large accelerated filer	☒	Accelerated filer	☐	Non-accelerated filer	☐	Smaller reporting company	☐	Emerging growth company

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes ☐ No ☒

The number of shares of the registrant's common stock outstanding as of April 30, 2021 was 199,837,259.

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PART I — Financial Information

ITEM 1. Consolidated Financial Statements.

INVITAE CORPORATION

Condensed Consolidated Balance Sheets

(in thousands)
(unaudited)

	March 31, 2021	December 31, 2020
Assets		
Current assets:		
Cash and cash equivalents	$ 194,218	$ 124,794
Marketable securities	477,380	229,186
Accounts receivable	45,592	47,722
Inventory	30,656	32,030
Prepaid expenses and other current assets	31,889	20,200
Total current assets	779,735	453,932
Property and equipment, net	72,909	66,102
Operating lease assets	75,546	45,109
Restricted cash	10,275	6,686
Intangible assets, net	994,071	981,845
Goodwill	1,925,889	1,863,623
Other assets	14,889	13,188
Total assets	$ 3,873,314	$ 3,430,485
Liabilities and stockholders' equity		
Current liabilities:		
Accounts payable	$ 38,989	$ 25,203
Accrued liabilities	94,036	86,058
Operating lease obligations	10,569	8,789
Finance lease obligations	2,190	1,695
Total current liabilities	145,784	121,745
Operating lease obligations, net of current portion	78,129	48,357
Finance lease obligations, net of current portion	3,645	3,123
Debt	106,685	104,449
Convertible senior notes, net	342,919	283,724
Deferred tax liability	50,568	51,538
Other long-term liabilities	769,295	841,256
Total liabilities	1,497,025	1,454,192
Commitments and contingencies (Note 8)		
Stockholders' equity:		
Common stock	20	19
Accumulated other comprehensive income	50	1
Additional paid-in capital	3,829,553	3,337,120
Accumulated deficit	(1,453,334)	(1,360,847)
Total stockholders' equity	2,376,289	1,976,293
Total liabilities and stockholders' equity	$ 3,873,314	$ 3,430,485

See accompanying notes to unaudited condensed consolidated financial statements.

INVITAE CORPORATION

Condensed Consolidated Statements of Operations

(in thousands, except per share amounts)
(unaudited)

	Three Months Ended March 31,	
	2021	2020
Revenue:		
Test revenue	$ 99,276	$ 63,078
Other revenue	4,345	1,170
Total revenue	103,621	64,248
Cost of revenue	75,491	40,422
Research and development	80,358	55,668
Selling and marketing	51,240	42,120
General and administrative	8,896	23,822
Loss from operations	(112,364)	(97,784)
Other income, net	4,465	4,708
Interest expense	(8,393)	(5,451)
Net loss before taxes	(116,292)	(98,527)
Income tax benefit	(6,800)	—
Net loss	$ (109,492)	$ (98,527)
Net loss per share, basic and diluted	$ (0.56)	$ (0.99)
Shares used in computing net loss per share, basic and diluted	194,000	99,632

See accompanying notes to unaudited condensed consolidated financial statements.

INVITAE CORPORATION

Condensed Consolidated Statements of Comprehensive Loss

(in thousands)
(unaudited)

	Three Months Ended March 31,	
	2021	**2020**
Net loss	$ (109,492)	$ (98,527)
Other comprehensive income:		
Unrealized income on available-for-sale marketable securities, net of tax	49	1,303
Comprehensive loss	$ (109,443)	$ (97,224)

See accompanying notes to unaudited condensed consolidated financial statements.

INVITAE CORPORATION

Condensed Consolidated Statements of Stockholders' Equity

(in thousands)
(unaudited)

	Three Months Ended March 31,	
	2021	**2020**
Common stock:		
Balance, beginning of period	$ 19	$ 10
Common stock issued	1	—
Balance, end of period	20	10
Accumulated other comprehensive income (loss):		
Balance, beginning of period	1	(9)
Unrealized income (loss) on available-for-sale marketable securities, net of tax	49	1,303
Balance, end of period	50	1,294
Additional paid-in capital:		
Balance, beginning of period	3,337,120	1,138,316
Common stock issued in connection with public offering, net	434,263	—
Common stock issued on exercise of stock options, net	1,760	1,145
Common stock issued pursuant to exercises of warrants	1,242	27
Common stock issued or issuable pursuant to acquisitions	74,822	42,453
Stock-based compensation expense	55,834	10,479
Reclassification of equity component of convertible senior notes	(75,488)	—
Reclassification of stock payable liabilities	—	(10,387)
Balance, end of period	3,829,553	1,182,033
Accumulated deficit:		
Balance, beginning of period	(1,360,847)	(758,677)
Cumulative effect of adoption of ASU 2020-06	17,005	—
Net loss	(109,492)	(98,527)
Balance, end of period	(1,453,334)	(857,204)
Total stockholders' equity	$ 2,376,289	$ 326,133

See accompanying notes to unaudited condensed consolidated financial statements.

INVITAE CORPORATION

Condensed Consolidated Statements of Cash Flows

(in thousands)
(unaudited)

	Three Months Ended March 31,	
	2021	**2020**
Cash flows from operating activities:		
Net loss	$ (109,492)	$ (98,527)
Adjustments to reconcile net loss to net cash used in operating activities:		
Depreciation and amortization	16,574	6,056
Stock-based compensation	58,775	29,278
Amortization of debt discount and issuance costs	2,735	3,632
Remeasurements of liabilities associated with business combinations	(66,999)	(3,367)
Benefit from income taxes	(6,800)	—
Post-combination expense for acceleration of unvested equity	2,959	—
Other	3,790	(659)
Changes in operating assets and liabilities, net of businesses acquired:		
Accounts receivable	2,814	(5,167)
Inventory	1,374	(6,619)
Prepaid expenses and other current assets	(11,237)	(434)
Other assets	811	602
Accounts payable	10,232	13,085
Accrued expenses and other long-term liabilities	4,944	(240)
Net cash used in operating activities	(89,520)	(62,360)
Cash flows from investing activities:		
Purchases of marketable securities	(325,956)	—
Proceeds from sales of marketable securities	—	12,532
Proceeds from maturities of marketable securities	74,763	24,965
Acquisition of businesses, net of cash acquired	(14,954)	(32,199)
Purchases of property and equipment	(6,431)	(3,831)
Other	(980)	(667)
Net cash provided by (used in) investing activities	(273,558)	800
Cash flows from financing activities:		
Proceeds from public offerings of common stock, net	434,263	—
Proceeds from issuance of common stock, net	2,551	1,172
Other	(723)	(621)
Net cash provided by financing activities	436,091	551
Net increase (decrease) in cash, cash equivalents and restricted cash	73,013	(61,009)
Cash, cash equivalents and restricted cash at beginning of period	131,480	157,572
Cash, cash equivalents and restricted cash at end of period	$ 204,493	$ 96,563
Supplemental cash flow information of non-cash investing and financing activities:		
Equipment acquired through finance leases	$ 1,740	$ —
Purchases of property and equipment in accounts payable and accrued liabilities	$ 6,341	$ 3,956
Common stock issued for acquisition of businesses	$ 74,822	$ 42,453
Consideration payable for acquisition of businesses	$ —	$ 5,773
Operating lease assets obtained in exchange for lease obligations, net	$ 32,279	$ 2,131

See accompanying notes to unaudited condensed consolidated financial statements.

INVITAE CORPORATION

Notes to Condensed Consolidated Financial Statements

1. Organization and description of business

Invitae Corporation ("Invitae," “the Company," "we," "us," and "our") was incorporated in the State of Delaware on January 13, 2010, as Locus Development, Inc. and we changed our name to Invitae Corporation in 2012. We offer high-quality, comprehensive, affordable genetic testing across multiple clinical areas, including hereditary cancer, cardiology, neurology, pediatrics, personalized oncology, metabolic conditions and rare diseases. To augment our offering and realize our mission, we have acquired multiple assets and businesses which further expanded our test menu and suite of genome management offerings and accelerated our entry into key genomics markets. Invitae operates in one segment.

Basis of presentation

The accompanying unaudited condensed consolidated financial statements have been prepared in accordance with U.S. generally accepted accounting principles (“U.S. GAAP”) for interim financial information and in accordance with the instructions to Form 10-Q and Rule 10-01 of Regulation S-X. Accordingly, they do not include all of the information and footnotes required by generally accepted accounting principles for complete financial statements. The unaudited interim condensed consolidated financial statements have been prepared on the same basis as the annual financial statements. In the opinion of management, the accompanying unaudited condensed consolidated financial statements reflect all adjustments (consisting only of normal recurring adjustments) considered necessary for a fair presentation. The information included in this Quarterly Report on Form 10-Q should be read in conjunction with the audited financial statements and notes thereto included in our Annual Report on Form 10-K for the year ended December 31, 2020. The results for the three months ended March 31, 2021 are not necessarily indicative of the results expected for the full fiscal year or any other periods.

2. Summary of significant accounting policies

Principles of consolidation

Our unaudited condensed consolidated financial statements include our accounts and the accounts of our wholly-owned subsidiaries. All intercompany balances and transactions have been eliminated in consolidation.

Use of estimates

The preparation of financial statements in conformity with U.S. GAAP requires management to make judgments, estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent liabilities as of the date of the financial statements and the reported amounts of revenue and expenses during the reporting period. We base these estimates on current facts, historical and anticipated results, trends and various other assumptions that we believe are reasonable under the circumstances, including assumptions as to future events. Actual results could differ materially from those judgments, estimates and assumptions. We evaluate our estimates on an ongoing basis.

Concentrations of credit risk and other risks and uncertainties

Financial instruments that potentially subject us to a concentration of credit risk consist of cash, cash equivalents, marketable securities and accounts receivable. Our cash and cash equivalents are primarily held by financial institutions in the United States. Such deposits may exceed federally insured limits.

Cash, cash equivalents and restricted cash

The following table provides a reconciliation of cash, cash equivalents and restricted cash reported within the consolidated balance sheets that sum to the total of the same amounts shown in the consolidated statements of cash flows (in thousands):

	March 31, 2021	December 31, 2020
Cash and cash equivalents	$ 194,218	$ 124,794
Restricted cash	10,275	6,686
Total cash, cash equivalents and restricted cash	$ 204,493	$ 131,480

Fair value of financial instruments

Our financial instruments consist principally of cash and cash equivalents, marketable securities, accounts payable, accrued liabilities, finance leases and liabilities associated with business combinations. The carrying amounts of certain of these financial instruments, including cash and cash equivalents, accounts receivable, accounts payable and accrued and other current liabilities approximate their current fair value due to the relatively short-term nature of these accounts. Based on borrowing rates available to us, the carrying value of our finance leases approximate their fair values. Liabilities associated with business combinations are recorded at their estimated fair value.

Prior period reclassifications

We have reclassified certain amounts in prior periods to conform with current presentation.

Immaterial correction of an error

We determined the historical classification of certain acquisition-related obligations as equity and the subsequent measurement of such obligations was inappropriate and instead should have been classified as liabilities and subsequently measured at fair value with changes recognized in other income (expense), net during the three months ended March 31, 2020. We determined that the impact of the error to previously issued financial statements was not material and have corrected the immaterial error in the three months ended March 31, 2020. The impact of this correction was an increase to other long-term liabilities of $10.1 million, a corresponding decrease to additional paid-in capital of $10.4 million and an increase to other income, net of $0.3 million.

Recent accounting pronouncements

We evaluate all Accounting Standards Updates (“ASUs”) issued by the Financial Accounting Standards Board ("FASB") for consideration of their applicability. ASUs not included in the disclosures in this report were assessed and determined to be either not applicable or are not expected to have a material impact on our consolidated financial statements.

Recently adopted accounting pronouncements

In August 2020, the FASB issued ASU No. 2020-06, *Accounting for Convertible Instruments and Contracts in an Entity's Own Equity*, which simplifies the accounting for certain convertible instruments, amends the guidance on derivative scope exceptions for contracts in an entity's own equity, and modifies the guidance on diluted earnings per share calculations as a result of these changes. This new standard is effective for our interim and annual periods beginning January 1, 2022, and earlier adoption is permitted. We elected to adopt the amendments on a modified retrospective basis effective January 1, 2021 which required a cumulative-effect adjustment to retained earnings. The cumulative-effect adjustment resulted in a decrease in accumulated deficit of $17.0 million related to the reversal of the equity component and associated issuance costs as well as adjustment of the related amortization costs of our existing convertible senior notes due in 2024. Reporting periods beginning on or after January 1, 2021 are presented under this new guidance while prior periods have not been adjusted and continue to be reported in accordance with our historic accounting under GAAP. See further information about our Senior Convertible Notes in Note 8, “Commitments and contingencies.”

3. Revenue, accounts receivable and deferred revenue

Test revenue is generated from sales of diagnostic tests and precision oncology products to four groups of customers: biopharmaceutical partners, patients who pay directly, patients' insurance carriers, and other business-to-business customers (e.g., hospitals, clinics, medical centers). Test revenue is generated in two ways: through a centralized lab and decentralized through the shipment of reactions to biopharmaceutical partners and other business-to-business customers. We refer to the set of reagents needed to perform a next-generation sequencing test as a "reaction." Amounts billed and collected, and the timing of collections, vary based on the type of payer. Other revenue consists principally of revenue recognized under contracts for biopharmaceutical development services and other collaboration and genome network agreements and is accounted for under the provisions provided in ASC 606, *Revenue from Contracts with Customers*.

Our revenue as disaggregated by payer category and revenue subtype was as follows (in thousands):

	Patient		Biopharma partner	Other business-to-business	Three Months Ended March 31, 2021
	Insurance	Direct			
Test revenue:					
Centralized	$ 60,891	$ 8,949	$ 10,274	$ 10,472	$ 90,586
Decentralized	—	—	383	8,307	8,690
Total test revenue	60,891	8,949	10,657	18,779	99,276
Other revenue	—	—	3,062	1,283	4,345
Total revenue	$ 60,891	$ 8,949	$ 13,719	$ 20,062	$ 103,621

	Patient		Biopharma partner	Other business-to-business	Three Months Ended March 31, 2020
	Insurance	Direct			
Test revenue:					
Centralized	$ 43,790	$ 5,791	$ 4,312	$ 9,185	$ 63,078
Total test revenue	43,790	5,791	4,312	9,185	63,078
Other revenue	—	—	453	717	1,170
Total revenue	$ 43,790	$ 5,791	$ 4,765	$ 9,902	$ 64,248

We recognize revenue related to billings based on estimates of the amount that will ultimately be realized. Cash collections for certain tests delivered may differ from rates originally estimated. As a result of new information, we update our estimate quarterly of the amounts to be recognized for previously delivered tests which resulted in the following increases to revenue and decreases to our loss from operations and basic and diluted net loss per share (in millions, except per share amounts):

	Three Months Ended March 31,	
	2021	2020
Revenue	$ 4.3	$ 1.4
Loss from operations	$ (4.3)	$ (1.4)
Net loss per share, basic and diluted	$ (0.02)	$ (0.01)

Influence of COVID-19

Our billable volumes decreased significantly in the second half of March 2020 as compared to the first few months of 2020 as a result of COVID-19 and related limitations and priorities across the healthcare system. Our daily test volumes have consistently increased from the low in March 2020, although we are currently still experiencing changes in product mix due to the impact of COVID-19. COVID-19 could have a material impact on our financial results for the foreseeable future, particularly on product mix and as a result, the revenue we recognize. We have reviewed and adjusted for the impact of COVID-19 on our estimates related to revenue recognition and expected credit losses.

In March 2020, the Coronavirus Aid, Relief, and Economic Security Act ("CARES Act") was signed into law which was a stimulus bill intended to bolster the economy, among other things, and provide assistance to qualifying businesses and individuals. The CARES Act included an infusion of funds into the healthcare system; in April 2020, we received $3.8 million as a part of this initiative, and in January 2021, we received an additional $2.3 million. These payments were recognized as other income, net in our consolidated statement of operations in the period received. At this time, we are not certain of the availability, extent or impact of any future relief provided under the CARES Act.

Accounts receivable

The majority of our accounts receivable represents amounts billed to biopharmaceutical partners and other business-to-business customers for test and other revenue recognized, and estimated amounts to be collected from third-party insurance payers for genetic testing revenue recognized. Also included are amounts due under the terms of collaboration and genome network agreements for diagnostic testing and data aggregation reporting services provided and proprietary platform access rights transferred.

We also record unbilled revenue for revenue recognized but yet to be billed for services provided to biopharmaceutical companies related to companion diagnostic development. This contract receivable was $6.6 million and $4.3 million as of March 31, 2021 and December 31, 2020, respectively, and was included in prepaid expenses and other current assets on the consolidated balance sheets.

Deferred revenue

We record a contract liability when cash payments are received or due in advance of our performance related to one or more performance obligations. The deferred revenue balance primarily consists of advanced billings for biopharmaceutical development services, including billings at the initiation of performance-based milestones, and recognized as revenue in the applicable future period when the revenue is earned. Also included are prepayments related to our consumer direct channel. During the three months ended March 31, 2021, we recognized revenue of $1.7 million from deferred revenue recorded in prior periods.

4. Business combinations

Singular Bio

In June 2019, we acquired 100% of the fully diluted equity of Singular Bio, Inc. ("Singular Bio"), a privately held company developing single molecule detection technology, for approximately $57.3 million, comprised of $53.9 million in the form of 2.5 million shares of our common stock and the remainder in cash.

In June 2019, we granted approximately $90.0 million of restricted stock units ("RSU") under our 2015 Stock Incentive Plan as inducement awards to new employees who joined Invitae in connection with our acquisition of Singular Bio. $45.0 million of the RSUs are time-based and vested in three equal installments in December 2019, June 2020, and December 2020, subject to the employee's continued service with us ("Time-based RSUs") and $45.0 million of the RSUs are performance-based RSUs ("PRSUs") that vest upon the achievement of certain performance conditions. Since the number of awards granted is based on a 30-day volume weighted-average share price with a fixed dollar value, these Time-based RSUs and PRSUs are liability-classified and the fair value is estimated at each reporting period based on the number of shares that are expected to be issued at each reporting date and our closing stock price, which combined are categorized as Level 3 inputs. Therefore, fair value of these awards and the number of shares issued are not fixed until the awards vest.

During the three months ended March 31, 2021, we recorded research and development stock-based compensation expense of nil related to the Time-based RSUs, and $2.4 million related to the PRSUs based on our evaluation of the probability of achieving performance conditions. During the three months ended March 31, 2020, we recorded research and development stock-based compensation expense of $7.6 million related to the Time-based RSUs and $11.2 million related to the PRSUs. As of March 31, 2021, the Time-based RSUs and PRSUs had a total fair value of $43.9 million and $46.2 million, respectively, based on a total estimated issuance of 3.6 million shares and expectation of the achievement of the performance conditions. As of March 31, 2021, all of the Time-based RSUs and 1.3 million of the PRSUs had vested with a total fair value of $80.0 million which was recorded in common stock issued or issuable pursuant to business combinations in the consolidated statements of stockholders' equity upon issuance.

Jungla

In July 2019, we acquired 100% of the equity interest of Jungla Inc. ("Jungla"), a privately held company developing a platform for molecular evidence testing in genes, for approximately $59.0 million, comprised of $44.9 million in the form of shares of our common stock and the remainder in cash.

We may be required to pay contingent consideration based on achievement of post-closing development milestones. As of the acquisition date, the fair value of this contingent consideration was $10.7 million including cash and common stock. These milestones are expected to be completed within approximately two years of the date of acquisition. The material factors that may impact the fair value of the contingent consideration, and therefore, this liability, are the probabilities and timing of achieving the related milestones and the discount rate used to estimate the fair value. Significant changes in any of the probabilities of success would result in a significant change in the fair value, which is estimated at each reporting date with changes reflected as a general and administrative expense. As of March 31, 2021, the fair value of this contingent consideration was $7.1 million.

Diploid

In March 2020, we acquired 100% of the equity interest of Orbicule BV ("Diploid"), a developer of artificial intelligence software capable of diagnosing genetic disorders using sequencing data and patient information, for approximately $82.3 million in cash and shares of our common stock. Of the stock purchase price consideration issued, approximately 0.4 million shares are subject to a hold-back to satisfy indemnification obligations that may arise.

As of March 31, 2021, we had a stock payable liability related to our acquisition of Diploid of $16.1 million which represents the hold-back obligation to issue 0.4 million shares subject to indemnification claims that may arise. This liability is adjusted at each reporting period based on the fair value of our common stock, which is a Level 3 input, with the change recorded in other income (expense), net.

Genelex and YouScript

In April 2020, we acquired 100% of the equity interest of Genelex Solutions, LLC ("Genelex") and YouScript Incorporated ("YouScript") to bring pharmacogenetic testing and integrated clinical decision support to Invitae. We acquired Genelex for approximately $13.2 million, primarily in shares of our common stock. Of the stock purchase price consideration issued, approximately 0.1 million shares were subject to a hold-back to satisfy indemnification obligations that may arise. We acquired YouScript for approximately $52.7 million, including cash consideration of $24.5 million and the remainder in shares of our common stock. Of the purchase price consideration for YouScript, approximately $1.4 million and 0.5 million shares of our common stock were subject to a hold-back to satisfy indemnification obligations that may arise.

As of the acquisition date, we recorded stock payable liabilities of $6.2 million to represent the hold-back obligation to issue shares subject to indemnification claims that may arise. These liabilities are adjusted at each reporting period based on the fair value of our common stock, which is a Level 3 input. As of March 31, 2021, the value of this liability was $19.7 million with the change recorded in other income (expense), net. In April 2021, the amounts held back to satisfy indemnification obligations for Genelex were released in full to the former shareholders.

We may be required to pay contingent consideration in the form of additional shares of our common stock in connection with the acquisition of Genelex if, within a specified period following the closing, we achieve a certain product milestone, in which case we would issue shares of our common stock with a value equal to a portion of the gross revenues actually received by us for a pharmacogenetic product reimbursed through certain payers during an earn-out period of up to four years. As of the acquisition date, the fair value of this contingent consideration was $2.0 million in the form of shares of our common stock. The material factors that may impact the fair value of the contingent consideration, and therefore, this liability, are the probabilities and timing of achieving the related milestone, the estimated revenues achieved for a pharmacogenetic product and the discount rate used to estimate the fair value. Significant changes in any of the probabilities of success would result in a significant change in the fair value, which is estimated at each reporting date with changes reflected as general and administrative expense. As of March 31, 2021, the fair value of this contingent consideration was $1.3 million.

ArcherDX

In October 2020, we acquired ArcherDX, Inc. ("ArcherDX"), a genomics analysis company democratizing precision oncology. Under the terms of the agreement, we acquired ArcherDX for upfront consideration consisting of 30.0 million shares of our common stock and $325.0 million in cash, plus up to an additional 27.0 million shares of our common stock payable in connection with the achievement of certain milestones. During the three months ended March 31, 2021, Invitae and the sellers of ArcherDX reached an agreement to reduce the purchase price by $1.2 million based on the final acquired net working capital. This adjustment was recorded during the three months ended March 31, 2021 and reduced the contingent consideration liability and goodwill by approximately $1.2 million.

Our purchase price allocation for the acquisition is preliminary and subject to revision as additional information about fair value of assets and liabilities becomes available, primarily related to our deferred tax liability assumed in connection with the acquisition. Additional information that existed as of the acquisition date but at the time was unknown to us may become known to us during the remainder of the measurement period, a period not to exceed 12 months from the acquisition date.

We may be required to pay contingent consideration based on achievement of post-closing development and revenue milestones. As of the acquisition date, the total fair value of the contingent consideration was $945.2 million. The milestones are expected to be completed within approximately two years from the date of the acquisition, with one of them being achieved in November 2020 which resulted in the issuance of 5.0 million shares of our common stock and a cash payment of $1.9 million. The material factors that may impact the fair value of the contingent consideration, and therefore the liability, are (i) the estimated number of shares issued, (ii) the volatility assumptions of our common stock used in the Monte Carlo simulation, (iii) the probabilities and timing of achievement of milestones and (iv) discount rates, all of which are Level 3 inputs not supported by market activity. Significant changes in any of these inputs may result in a significant change in fair value, which is estimated at each reporting date with changes reflected as general and administrative expense. As of March 31, 2021, the fair value of the contingent consideration representing the remaining milestones was $723.5 million.

In connection with the acquisition, we granted awards of Invitae common stock to new employees who joined Invitae in connection with our acquisition of ArcherDX which vest upon the achievement of the contingent consideration milestones discussed above and are subject to the employee's continued service with us, unless terminated without cause in which case vesting is only dependent on milestone achievement. As the number of shares that are expected to be issued are fixed, the awards are equity-classified. During the three months ended March 31, 2021, we recorded $40.6 million in stock-based compensation expense related to the ArcherDX milestones, of which $30.4 million was due to an accounting modification of certain awards whereby the employee's continued substantive services are no longer required.

One Codex

In February 2021, we acquired 100% of the equity interest of Reference Genomics, Inc. d/b/a One Codex ("One Codex"), a company developing and commercializing products and services relating to microbiome sequencing, analysis and reporting, for upfront consideration consisting of $17.3 million in cash and 1.4 million shares of our common stock, of which approximately 0.2 million shares are subject to a hold back to satisfy indemnification obligations that may arise following the closing. These shares subject to a hold back were issued to a third-party at the closing date to hold in escrow until the escrow period is complete, and as such were classified as equity. We included the financial results of One Codex in our consolidated financial statements from the acquisition date, which were not material.

The following table summarizes the purchase price and post-combination expense recorded as a part of the acquisition of One Codex (in thousands):

	Purchase Price	Post-combination Expense
Cash transferred	$ 16,504	$ 783
Hold-back consideration - common stock	8,113	359
Common stock transferred	58,774	2,600
Total	$ 83,391	$ 3,742

Assets acquired and liabilities assumed are recorded based on valuations derived from estimated fair value assessments and assumptions used by us. While we believe that our estimates and assumptions underlying the valuations are reasonable, different estimates and assumptions could result in different valuations assigned to the individual assets acquired and liabilities assumed, and the resulting amount of goodwill. The following table summarizes the fair values of assets acquired and liabilities assumed through our acquisition of One Codex at the date of acquisition (in thousands):

Cash	$	1,549
Accounts receivable		684
Developed technology		23,841
Customer relationships		440
Total identifiable assets acquired		26,514
Other liabilities		(415)
Deferred tax liability		(6,150)
Net identifiable assets acquired		19,949
Goodwill		63,442
Total purchase price	$	83,391

Based on the guidance provided in ASC 805, *Business Combinations*, we accounted for the acquisition of One Codex as a business combination and determined that 1) One Codex was a business which combines inputs and processes to create outputs, and 2) substantially all of the fair value of gross assets acquired was not concentrated in a single identifiable asset or group of similar identifiable assets.

Our purchase price allocation for the acquisition is preliminary and subject to revision as additional information about fair value of assets and liabilities becomes available, primarily related to our deferred tax liability assumed in connection with the acquisition. Additional information that existed as of the acquisition date but at the time was unknown to us may become known to us during the remainder of the measurement period, a period not to exceed 12 months from the acquisition date.

We measured the identifiable assets and liabilities assumed at their acquisition date fair values separately from goodwill. The intangible assets acquired were developed technology related to One Codex's microbiome and infectious disease platform and its customer relationships in place at time of acquisition. The fair value of the intangible assets was estimated using an income approach with an estimated useful life of nine years.

Goodwill represents the excess of the purchase price over the fair value of the net tangible and intangible assets acquired. The acquisition of One Codex resulted in the recognition of $63.4 million of goodwill which we believe relates primarily to expansion of the acquired technology to apply to new areas of genetic testing. The goodwill created as a result of the acquisition of One Codex is not deductible for tax purposes.

5. Goodwill and intangible assets

Goodwill

The changes in the carrying amounts of goodwill were as follows (in thousands):

Balance as of December 31, 2020	$	1,863,623
Goodwill adjustment		(1,176)
Goodwill acquired		63,442
Balance as of March 31, 2021	$	1,925,889

Intangible assets

The following table presents details of our intangible assets (in thousands):

	March 31, 2021				December 31, 2020			
	Cost	Accumulated Amortization	Net	Weighted-Average Useful Life (in Years)	Cost	Accumulated Amortization	Net	Weighted-Average Useful Life (in Years)
Customer relationships	$ 41,515	$ (9,497)	$ 32,018	10.8	$ 41,075	$ (8,292)	$ 32,783	10.8
Developed technology	421,404	(41,079)	380,325	10.5	397,563	(31,013)	366,550	10.6
Non-compete agreement	286	(243)	43	5.0	286	(229)	57	5.0
Trade name	21,085	(888)	20,197	12.0	21,085	(447)	20,638	12.0
Patent assets and licenses	496	(112)	384	15.0	496	(103)	393	15.0
Right to develop new technology	19,359	(643)	18,716	15.0	19,359	(323)	19,036	15.0
In-process research and development	542,388	—	542,388	n/a	542,388	—	542,388	n/a
	$ 1,046,533	$ (52,462)	$ 994,071	10.8	$ 1,022,252	$ (40,407)	$ 981,845	10.9

Acquisition-related intangibles included in the above table are finite-lived, other than in-process research and development which has an indefinite life, and are carried at cost less accumulated amortization. Customer relationships related to our 2017 business combinations are being amortized on an accelerated basis, in proportion to estimated cash flows. All other finite-lived acquisition-related intangibles are being amortized on a straight-line basis over their estimated lives, which approximates the pattern in which the economic benefits of the intangible assets are realized. Amortization expense was $12.1 million and $3.6 million for the three months ended March 31, 2021 and 2020, respectively. Amortization expense is recorded to cost of revenue, research and development, selling and marketing and general and administrative expense.

The following table summarizes our estimated future amortization expense of intangible assets with finite lives as of March 31, 2021 (in thousands):

2021 (remainder of year)	$ 37,325
2022	48,095
2023	47,083
2024	46,804
2025	45,051
Thereafter	227,325
Total estimated future amortization expense	$ 451,683

6. Balance sheet components

Inventory

Inventory consisted of the following (in thousands):

	March 31, 2021	December 31, 2020
Raw materials	$ 20,976	$ 21,324
Work in progress	7,743	8,847
Finished goods	1,937	1,859
Total inventory	$ 30,656	$ 32,030

While we have not experienced significant disruption in our supply chain and we do not yet know the full impact COVID-19 will have on our supply chain, we have increased our inventory on hand to respond to potential future disruptions that may occur.

Property and equipment, net

Property and equipment consisted of the following (in thousands):

	March 31, 2021	December 31, 2020
Leasehold improvements	$ 26,224	$ 26,516
Laboratory equipment	48,434	45,342
Computer equipment	11,141	10,939
Software	705	566
Furniture and fixtures	1,968	1,967
Automobiles	58	58
Construction-in-progress	19,446	12,061
Total property and equipment, gross	107,976	97,449
Accumulated depreciation and amortization	(35,067)	(31,347)
Total property and equipment, net	$ 72,909	$ 66,102

Depreciation expense was $3.8 million and $2.0 million for the three months ended March 31, 2021 and 2020, respectively.

Accrued liabilities

Accrued liabilities consisted of the following (in thousands):

	March 31, 2021	December 31, 2020
Accrued compensation and related expenses	$ 33,348	$ 25,221
Compensation and other liabilities associated with business combinations	27,515	25,600
Deferred revenue	5,264	6,378
Other	27,909	28,859
Total accrued liabilities	$ 94,036	$ 86,058

Other long-term liabilities

Other long-term liabilities consisted of the following (in thousands):

	March 31, 2021	December 31, 2020
Deferred revenue, non-current	1,380	1,380
Compensation and other liabilities associated with business combinations, non-current	753,815	825,976
Other	14,100	13,900
Total other long-term liabilities	$ 769,295	$ 841,256

7. Fair value measurements

Financial assets and liabilities are recorded at fair value. Fair value is defined as the price that would be received to sell an asset or paid to transfer a liability (an exit price) in an orderly transaction between market participants at the reporting date. The authoritative guidance establishes a three-level valuation hierarchy that prioritizes the inputs to valuation techniques used to measure fair value based upon whether such inputs are observable or unobservable. Observable inputs reflect market data obtained from independent sources, while unobservable inputs reflect market assumptions made by the reporting entity.

The three-level hierarchy for the inputs to valuation techniques is summarized as follows:

Level 1—Observable inputs such as quoted prices (unadjusted) for identical instruments in active markets.

Level 2—Observable inputs such as quoted prices for similar instruments in active markets, quoted prices for identical or similar instruments in markets that are not active, or model-derived valuations whose significant inputs are observable.

Level 3—Unobservable inputs that reflect the reporting entity's own assumptions.

The following tables set forth the fair value of our consolidated financial instruments that were measured at fair value on a recurring basis (in thousands):

	March 31, 2021						
	Amortized Cost	Unrealized Gains	Unrealized Losses	Estimated Fair Value	Level 1	Level 2	Level 3
Financial assets:							
Money market funds	$ 177,176	$ —	$ —	$ 177,176	$ 177,176	$ —	$ —
U.S. Treasury notes	403,840	47	(4)	403,883	403,883	—	—
U.S. government agency securities	73,490	7	—	73,497	—	73,497	—
Total financial assets	$ 654,506	$ 54	$ (4)	$ 654,556	$ 581,059	$ 73,497	$ —
Financial liabilities:							
Stock payable liability				$ 35,858	$ —	$ —	$ 35,858
Contingent consideration				731,842	—	—	731,842
Total financial liabilities				$ 767,700	$ —	$ —	$ 767,700

	March 31, 2021
Reported as:	
Cash equivalents	$ 166,901
Restricted cash	10,275
Marketable securities	477,380
Total cash equivalents, restricted cash, and marketable securities	$ 654,556
Accrued liabilities	$ 14,577
Other long-term liabilities	753,123
Total liabilities	$ 767,700

	December 31, 2020						
	Amortized Cost	Unrealized Gains	Unrealized Losses	Estimated Fair Value	Level 1	Level 2	Level 3
Financial assets:							
Money market funds	$ 83,109	$ —	$ —	$ 83,109	$ 83,109	$ —	$ —
U.S. Treasury notes	164,894	7	(15)	164,886	164,886	—	—
U.S. government agency securities	64,291	9	—	64,300	—	64,300	—
Total financial assets	$ 312,294	$ 16	$ (15)	$ 312,295	$ 247,995	$ 64,300	$ —
Financial liabilities:							
Stock payable liability				$ 39,237	$ —	$ —	$ 39,237
Contingent consideration				796,639	—	—	796,639
Total financial liabilities				$ 835,876	$ —	$ —	$ 835,876

	December 31, 2020
Reported as:	
Cash equivalents	$ 76,423
Restricted cash	6,686
Marketable securities	229,186
Total cash equivalents, restricted cash, and marketable securities	$ 312,295
Accrued liabilities	$ 10,592
Other long-term liabilities	825,284
Total liabilities	$ 835,876

There were no transfers between Level 1, Level 2 and Level 3 during the periods presented. The total fair value of investments with unrealized losses at March 31, 2021 was $82.5 million. Our debt securities of U.S. government agencies are classified as Level 2 as they are valued based upon quoted market prices for similar instruments in active markets, quoted prices for identical or similar instruments in markets that are not active and model-based valuation techniques for which all significant inputs are observable in the market or can be corroborated by observable market data for substantially the full term of the assets. Where applicable, these models project future cash flows and discount the future amounts to a present value using market-based observable inputs obtained from various third-party data providers, including but not limited to benchmark yields, interest rate curves, reported trades, broker/dealer quotes and reference data.

Stock payable liabilities relate to certain indemnification hold-backs resulting from business combinations that are settled in shares of our common stock. We elected to account for these liabilities using the fair value option due to the inherent nature of the liabilities and the changes in value of the underlying shares that will ultimately be issued to settle the liabilities. The estimated fair value of these liabilities is classified as Level 3 and determined based upon the number of shares that are issuable to the sellers and the quoted closing price of our common stock as of the reporting date. The number of shares that will ultimately be issued is subject to adjustment for indemnified claims that existed as of the closing date for each acquisition. Changes in the number of shares issued and share price can significantly affect the estimated fair value of the liabilities. During the three months ended March 31, 2021 and 2020, the change in fair value related to stock payable liabilities recorded to other income (expense), net was income of $3.4 million during both periods.

8. Commitments and contingencies

Leases

In 2015, we entered into an operating lease agreement for our headquarters and main production facility in San Francisco, California which commenced in 2016. This lease expires in 2026 and we may renew the lease for an additional ten years. This optional period was not considered reasonably certain to be exercised and therefore we determined the lease term to be a ten-year period expiring in 2026. In connection with the execution of the lease, we provided a security deposit of approximately $4.6 million which is included in restricted cash in our consolidated balance sheets. We also have other operating leases for office and laboratory space domestically and internationally. We expect to enter into new leases and modify existing leases as we support continued growth of our operations.

We have entered into various finance lease agreements to obtain laboratory equipment. The terms of our finance leases are generally three years and are typically secured by the underlying equipment. The portion of the future payments designated as principal repayment and related interest was classified as a finance lease obligation on our consolidated balance sheets. Finance lease assets are recorded within other assets on our consolidated balance sheets.

Debt financing

In October 2020, we entered into a credit agreement with a financial institution under which we borrowed $135.0 million (the "2020 Term Loan") concurrent with the closing of the ArcherDX acquisition. The 2020 Term Loan is secured by a first priority lien on all of our and our subsidiaries' assets, and is guaranteed by us and our subsidiaries. The 2020 Term Loan bears interest at an annual rate equal to three-month LIBOR, subject to a 2.00% LIBOR floor, plus a margin of 8.75%. If three-month LIBOR can no longer be determined or if the applicable governmental authority ceases to supervise or sanction such rates, then we shall endeavor to agree with the administrative agent, an alternate rate of interest that gives due consideration to the then prevailing market convention for determining interest for comparable loans in the United States; provided that until such alternative rate of interest is agreed, the 2020 Term Loan shall bear interest at the Wall Street Journal Prime Rate. The 2020 Term Loan will mature on (i) June 1, 2024 if at such time our 2024 Notes (defined below) are outstanding and are due to mature on September 1, 2024 (provided that if, prior to such date, the maturity date of at least 80% of the 2024 Notes is extended to a date that is prior to September 1, 2025, the maturity date for the 2020 Term Loan will be automatically extended to a date that is 90 days prior to such 2024 Notes maturity date as extended), or (ii) otherwise, on June 1, 2025. The full amount of the 2020 Term Loan is due upon maturity. Debt discounts, including debt issuance costs, related to the 2020 Term Loan of $32.8 million were recorded as a direct deduction from the debt liability and are being amortized to interest expense over the term of the 2020 Term Loan. Interest expense related to our debt financings, excluding the impact of our 2024 Notes (defined below), was $5.9 million and nil for the three months ended March 31, 2021 and 2020, respectively.

Convertible senior notes due 2024

In September 2019, we issued, at par value, $350.0 million aggregate principal amount of 2.00% convertible senior notes due 2024 (the "2024 Notes") in a private offering. The 2024 Notes are our senior unsecured obligations and will mature on September 1, 2024, unless earlier converted, redeemed or repurchased. The 2024 Notes bear cash interest at a rate of 2.0% per year, payable semi-annually in arrears on March 1 and September 1 of each year, beginning on March 1, 2020.

Upon conversion, the 2024 Notes will be convertible into cash, shares of our common stock or a combination of cash and shares of our common stock, at our election. The initial conversion rate for the 2024 Notes is 33.6293 shares of our common stock per $1,000 principal amount of the 2024 Notes (equivalent to an initial conversion price of approximately $29.74 per share of common stock).

If we undergo a fundamental change (as defined in the indenture governing the 2024 Notes), the holders of the 2024 Notes may require us to repurchase all or any portion of their 2024 Notes for cash at a repurchase price equal to 100% of the principal amount of the 2024 Notes to be repurchased plus accrued and unpaid interest to, but excluding, the redemption date.

The 2024 Notes will be convertible at the option of the holders at any time prior to the close of business on the business day immediately preceding March 1, 2024, only under the following circumstances: (1) during any calendar quarter commencing after the calendar quarter ending on December 31, 2019 (and only during such calendar quarter), if the last reported sale price of our common stock for at least 20 trading days (whether or not consecutive) during a period of 30 consecutive trading days ending on, and including, the last trading day of the immediately preceding calendar quarter is greater than or equal to 130% of the conversion price for the 2024 Notes on each applicable trading day; (2) during the five business day period after any five consecutive trading day period (the “measurement period”) in which the trading price per $1,000 principal amount of 2024 Notes for each trading day of the measurement period was less than 98% of the product of the last reported sale price of our common stock and the conversion rate on each such trading day; (3) if we call any or all of the 2024 Notes for redemption, at any time prior to the close of business on the scheduled trading day immediately preceding the redemption date; or (4) upon the occurrence of specified corporate events. On or after March 1, 2024 until the close of business on the business day immediately preceding the maturity date, holders may convert their 2024 Notes at any time, regardless of the foregoing circumstances. These notes were convertible at the option of the holders during the quarters beginning on January 1, 2021 and April 1, 2021 due to the sale price of our common stock during the quarters ended December 31, 2020 and March 31, 2021, respectively. No holders converted their notes during the three months ended March 31, 2021.

We may not redeem the 2024 Notes prior to September 6, 2022. We may redeem for cash all or any portion of the 2024 Notes, at our option, on or after September 6, 2022 and on or before the 30th scheduled trading day immediately before the maturity date if the last reported sale price of our common stock has been at least 130% of the conversion price then in effect for at least 20 trading days (whether or not consecutive) during any 30 consecutive trading day period (including the last trading day of such period) ending on, and including, the trading day immediately preceding the date on which we provide notice of redemption at a redemption price equal to 100% of the principal amount of the notes to be redeemed, plus accrued and unpaid interest to, but excluding, the redemption date.

We adopted the provisions of ASU 2020-06 on January 1, 2021; see further information in Note 2, "Summary of significant accounting policies." The 2024 Notes consisted of the following (in thousands):

	March 31, 2021	December 31, 2020
Outstanding principal	$ 350,000	$ 350,000
Unamortized debt discount and issuance costs	(7,081)	(66,276)
Net carrying amount, liability component	$ 342,919	$ 283,724

As of March 31, 2021, the fair value of the 2024 Notes was $527.1 million. The estimated fair value of the 2024 Notes, which are classified as Level 2 financial instruments, was determined based on the estimated or actual bid prices of the 2024 Notes in an over-the-counter market. We recognized $2.2 million and $5.4 million of interest expense related to the 2024 Notes during the three months ended March 31, 2021 and 2020, respectively. Of the interest expense recognized during the three months ended March 31, 2021, $0.5 million was related to amortization of issuance costs and the remainder was related to contractual interest incurred.

Other commitments

In the normal course of business, we enter into various purchase commitments primarily related to service agreements and laboratory supplies. At March 31, 2021, our total future payments under noncancelable unconditional purchase commitments having a remaining term of over one year were $59.6 million.

Guarantees and indemnifications

As permitted under Delaware law and in accordance with our bylaws, we indemnify our directors and officers for certain events or occurrences while the officer or director is or was serving in such capacity. The maximum amount of potential future indemnification is unlimited; however, we maintain director and officer liability insurance. This insurance allows the transfer of the risk associated with our exposure and may enable us to recover a portion of any future amounts paid. We believe the fair value of these indemnification agreements is minimal. Accordingly, we did not record any liabilities associated with these indemnification agreements at March 31, 2021 or December 31, 2020.

Contingencies

We were not a party to any material legal proceedings at March 31, 2021, or at the date of this report except for matters listed below. We cannot currently predict the outcome of these actions. We are and may from time to time become involved in various legal proceedings and claims arising in the ordinary course of business. While we believe any such claims are unsubstantiated, and we believe we are in compliance with applicable laws and regulations applicable to our business, the resolution of any such claims could be material.

Natera, Inc.

On January 27, 2020, Natera filed a lawsuit against ArcherDX (a subsidiary of Invitae effective October 2, 2020) in the United States District Court for the District of Delaware, alleging that ArcherDX's products using AMP chemistry, and the manufacture, use, sale, and offer for sale of such products, infringe U.S. Patent No. 10,538,814. On March 25, 2020, ArcherDX filed an answer denying Natera's allegations and asserting certain affirmative defenses and counterclaims, including that U.S. Patent No. 10,538,814 is invalid and not infringed. On April 15, 2020, Natera filed an answer denying ArcherDX's counterclaims and filed an amended complaint alleging that ArcherDX's products using AMP chemistry, including STRATAFIDE, PCM, LiquidPlex, ArcherMET, FusionPlex, and VariantPlex, and the manufacture, use, sale, and offer for sale of such products, infringe U.S. Patent No. 10,538,814, U.S. Patent No. 10,557,172, U.S. Patent No. 10,590,482, and U.S. Patent No. 10,597,708, each of which are held by Natera. Natera seeks, among other things, damages and other monetary relief, costs and attorneys' fees, and an order enjoining ArcherDX from further infringement of such patents. On May 13, 2020, ArcherDX filed an answer to Natera's amended complaint denying Natera's allegations and asserting certain affirmative defenses and counterclaims, including that the asserted patents are invalid and not infringed. On June 3, 2020, Natera filed an answer denying ArcherDX's counterclaims. On June 4, 2020, ArcherDX filed a motion seeking dismissal of Natera's infringement claims against STRATAFIDE, PCM, and ArcherMET, and for a judgment that U.S. Patent No. 10,538,814, U.S. Patent No. 10,557,172, and U.S. Patent No. 10,590,482 are invalid. On August 6, 2020, Natera filed another complaint against ArcherDX in the United States District Court for the District of Delaware alleging that ArcherDX's products using AMP chemistry, including STRATAFIDE, PCM, LiquidPlex, ArcherMET, and VariantPlex, and the manufacture, use, sale, and offer for sale of such products, infringe U.S. Patent No. 10,731,220. Natera seeks, among other things, damages and other monetary relief, costs and attorneys' fees, and an order enjoining ArcherDX from further infringement of the patent. On October 13, 2020, the court issued an order denying ArcherDX's motion for dismissal of Natera's infringement claims against STRATAFIDE, PCM, and ArcherMET, and declined to enter judgment that U.S. Patent No. 10,538,814, U.S. Patent No. 10,557,172, and U.S. Patent No. 10,590,482 are invalid. On January 12, 2021, the court issued an order granting Natera leave to amend its complaint to add Invitae as a co-defendant and plead allegations that ArcherDX and Invitae induce end-users to infringe the patents-in-suit. Natera filed its Second Amended Complaint on the same day, with service completed on January 15, 2021. ArcherDX and Invitae filed answers to the Second Amended Complaint on January 26, 2021 and February 5, 2021, respectively, denying Natera's allegations and restating certain affirmative defenses and counterclaims of non-infringement and invalidity. The litigations have now been consolidated for all purposes. A claim construction briefing is complete, and a hearing was held on April 26, 2021. Discovery is ongoing, and trial has been scheduled for May 2022.

QIAGEN Sciences

On July 10, 2018, ArcherDX and the General Hospital Corporation d/b/a Massachusetts General Hospital, which we refer to as MGH, filed a lawsuit in the United States District Court for the District of Delaware against QIAGEN Sciences, LLC, QIAGEN LLC, QIAGEN Beverly, Inc., QIAGEN Gaithersburg, Inc., QIAGEN GmbH and QIAGEN N.V., which is collectively referred to herein as QIAGEN, and a named QIAGEN executive who was a former member of ArcherDX's board of directors, alleging several causes of action, including infringement of the '810 Patent, trade secret misappropriation, breach of fiduciary duty, false advertising, tortious interference and deceptive trade practices. The '810 Patent relates to methods for preparing a nucleic acid for sequencing and aspects of ArcherDX's AMP technology. On October 30, 2019, with the permission of the Court, ArcherDX amended ArcherDX's complaint to add a claim for infringement of the '597 Patent. The '597 Patent relates to methods of preparing and analyzing nucleic acids, such as by enriching target sequences prior to sequencing, and aspects of ArcherDX's AMP technology. The QIAGEN products that ArcherDX alleges infringe the '810 Patent and the '597 Patent include, but are not limited to, QIAseq Targeted DNA Panels, QIAseq Targeted RNAscan Panels, QIAseq Index Kits and QIAseq Immune Repertoire RNA Library Kits. ArcherDX is seeking, among other things, damages for ArcherDX's lost profits due to QIAGEN's infringement and a permanent injunction enjoining QIAGEN from marketing and selling the infringing products and from using ArcherDX's trade secrets. On December 5, 2019, QIAGEN and the named QIAGEN executive submitted their answer denying the allegations in ArcherDX's complaint and asserting affirmative defenses that, among other things, the '810 Patent and '597 Patent are not infringed by QIAGEN's products, that both patents are invalid, and that the complaint fails to state any claim for which relief may be granted. On March 1, 2021, each of ArcherDX and QIAGEN moved for summary judgment on issues relating to infringement and validity of ArcherDX's patents and trade secret misappropriation; briefing closed on April 19, 2021 and the court has not yet issued its decision. A mediation conference is set for June 15, 2021. Trial is currently scheduled for August 2021.

9. Stockholders' equity

Shares outstanding

Shares of convertible preferred and common stock were as follows (in thousands):

	Three Months Ended March 31,	
	2021	**2020**
Convertible preferred stock:		
Shares outstanding, beginning and end of period	125	125
Common stock:		
Shares outstanding, beginning of period	185,886	98,796
Common stock issued in connection with public offering	8,932	—
Common stock issued on exercise of stock options, net	401	178
Common stock issued pursuant to vesting of RSUs	712	426
Common stock issued pursuant to exercises of warrants	208	142
Common stock issued pursuant to business combinations	1,375	2,378
Shares outstanding, end of period	197,514	101,920

Convertible preferred stock

In August 2017, in a private placement to certain accredited investors, we issued shares of our Series A convertible preferred stock which are convertible into common stock on a one-for-one basis, subject to adjustment for events such as stock splits, combinations and the like. The Series A convertible preferred stock is a non-voting common stock equivalent with a par value of $0.0001 and has the right to receive dividends first or simultaneously with payment of dividends on common stock. In the event of any liquidation or dissolution of the Company, the Series A preferred stock is entitled to receive $0.001 per share prior to the payment of any amount to any holders of capital stock ranking junior to the Series A preferred stock and thereafter shall participate pari passu with the holders of our common stock (on an as-if-converted-to-common-stock basis). As of March 31, 2021 and 2020, 0.1 million shares of our Series A convertible preferred stock were outstanding.

2018 Sales Agreement

In August 2018, we entered into a Common Stock Sales Agreement (the "2018 Sales Agreement") with Cowen and Company, LLC ("Cowen") under which we may have offered and sold from time to time at our sole discretion shares of our common stock through Cowen as our sales agent, in an aggregate amount not to exceed $75.0 million. Cowen may have sold the shares by any method permitted by law deemed to be an "at the market" offering as defined in Rule 415 of the Securities Act of 1933, or Securities Act, including without limitation sales made directly on The New York Stock Exchange, as well as in privately negotiated transactions, subject to our prior approval. Per the terms of the agreement, Cowen received a commission equal to 3% of the gross proceeds of the sales price of all shares sold through it as sales agent under the 2018 Sales Agreement. In March 2019, we amended the 2018 Sales Agreement to increase the aggregate amount of our common stock to be sold under this agreement not to exceed $175.0 million. During 2018, 2019 and 2020, we sold 8.7 million shares of our common stock for gross proceeds of the full $175.0 million under this agreement, and generated net proceeds of $169.1 million.

Public offering

In January 2021, we issued, in an underwritten public offering, an aggregate of 8.9 million shares of our common stock at a price of $51.50 per share, for gross proceeds of $460.0 million and net proceeds of $434.3 million after deducting underwriting discounts and commissions and offering expenses.

In April 2020, we sold, in an underwritten public offering, an aggregate of 20.4 million shares of our common stock at a price of $9.00 per share, for gross proceeds of $184.0 million and net proceeds of $173.0 million.

Private placement

In connection with our acquisition of ArcherDX, in June 2020 we entered into a definitive agreement to sell $275.0 million in common stock in a private placement at a price of $16.85 per share. We received net proceeds of $263.7 million after deducting underwriting discounts and commissions and offering expenses upon the closing of the private placement in October 2020, concurrently with our acquisition of ArcherDX.

10. Stock incentive plans

Stock incentive plans

In 2010, we adopted the 2010 Incentive Plan (the "2010 Plan"). The 2010 Plan provides for the granting of stock-based awards to employees, directors and consultants under terms and provisions established by our Board of Directors. Under the terms of the 2010 Plan, options may be granted at an exercise price not less than the fair market value of our common stock. For employees holding more than 10% of the voting rights of all classes of stock, the exercise prices for incentive and nonstatutory stock options must be at least 110% of fair market of our common stock on the grant date, as determined by our Board of Directors. The terms of options granted under the 2010 Plan may not exceed ten years.

In January 2015, we adopted the 2015 Stock Incentive Plan (the "2015 Plan"), which became effective upon the closing of our initial public offering ("IPO"). Shares outstanding under the 2010 Plan were transferred to the 2015 Plan upon effectiveness of the 2015 Plan. The 2015 Plan provides for automatic annual increases in shares available for grant, beginning on January 1, 2016 through January 1, 2025. In addition, shares subject to awards under the 2010 Plan that are forfeited or terminated will be added to the 2015 Plan. The 2015 Plan provides for the grant of incentive stock options, nonstatutory stock options, restricted stock awards, stock units, stock appreciation rights and other forms of equity compensation, all of which may be granted to employees, including officers, non-employee directors and consultants. Additionally, the 2015 Plan provides for the grant of cash-based awards.

Options granted generally vest over a period of four years. Typically, the vesting schedule for options granted to newly hired employees provides that 1/4 of the award vests upon the first anniversary of the employee's date of hire, with the remainder of the award vesting monthly thereafter at a rate of 1/48 of the total shares subject to the option. All other options typically vest in equal monthly installments over the four-year vesting schedule. Upon the acquisition of ArcherDX in October 2020, any option that was outstanding was converted into a fully vested option to purchase a share of our common stock, which resulted in the issuance of options to purchase 3.7 million shares of our common stock.

RSUs generally vest over a period of three years. Typically, the vesting schedule for RSUs provides that 1/3 of the award vests upon each anniversary of the grant date, with certain awards that include a portion that vests immediately upon grant. In June 2019, we granted Time-based RSUs in connection with the acquisition of Singular Bio which vested in three equal installments over a period of 18 months and PRSUs that vest based on the achievement of performance conditions; see further details in Note 4, "Business combinations." In December 2020, we granted RSUs in connection with an asset acquisition which vest in two equal installments in December 2021 and December 2022, subject to the employee's continued service with us.

Under our management incentive compensation plan, in April 2021, we granted 0.2 million PRSUs to our executive officers as well as other specified senior level employees based on the level of achievement of specified 2021 performance goals directed at cash burn, revenue, operating expenses as a percentage of revenue, and volume. Also in April 2021, we granted 0.5 million RSUs and 0.3 million options to acquire shares of our common stock to our executive officers, as well as other specified senior level employees and members of our board of directors.

Activity under the 2010 Plan and the 2015 Plan is set forth below (in thousands, except per share amounts and years):

	Shares Available For Grant	Stock Options Outstanding	Weighted-Average Exercise Price Per Share	Weighted-Average Remaining Contractual Life (Years)	Aggregate Intrinsic Value
Balances at December 31, 2020	7,447	4,877	$ 7.75	6.8	$ 166,130
Additional shares reserved	7,620	—			
Options exercised	—	(403)	4.40		
RSUs and PRSUs granted [1]	(502)	—			
RSUs and PRSUs cancelled	93	—			
Balances at March 31, 2021	14,658	4,474	$ 8.05	6.5	$ 134,967
Options exercisable at March 31, 2021		4,091	$ 7.20	6.3	$ 126,858
Options vested and expected to vest at March 31, 2021		4,427	$ 7.94	6.5	$ 133,999

[1] Includes the changes in RSUs and PRSUs granted as a part of the Singular Bio acquisition in June 2019 and awards granted in an asset acquisition in December 2020 which are based on a fixed dollar value. The estimated number of shares issued will be variable until the awards vest.

The aggregate intrinsic value is calculated as the difference between the exercise price of the underlying stock options and the fair value of our common stock for stock options that were in-the-money.

The following table summarizes RSU activity (in thousands, except per share data):

	Number of Shares	Weighted- Average Grant Date Fair Value Per Share
Balance at December 31, 2020	6,602	$ 12.89
RSUs and PRSUs granted [1]	502	$ 35.81
RSUs and PRSUs vested	(713)	$ 18.60
RSUs and PRSUs cancelled	(93)	$ 18.40
Balance at March 31, 2021	6,298	$ 13.99

[1] Includes the changes in RSUs and PRSUs granted as a part of the Singular Bio acquisition in June 2019 and awards granted in an asset acquisition in December 2020 which are based on a fixed dollar value. The estimated number of shares issued will be variable until the awards vest which are adjusted above. The weighted-average grant date fair value per share reflects the fair value pricing of the full award.

Stock-based compensation

The following table summarizes stock-based compensation expense included in the consolidated statements of operations (in thousands):

	Three Months Ended March 31,	
	2021	2020
Cost of revenue	$ 2,185	$ 861
Research and development	15,534	22,204
Selling and marketing	3,431	1,823
General and administrative	37,625	4,390
Total stock-based compensation expense	$ 58,775	$ 29,278

11. Net loss per share

The following table presents the calculation of basic and diluted net loss per share (in thousands, except per share amounts):

	Three Months Ended March 31,	
	2021	2020
Net loss	$ (109,492)	$ (98,527)
Shares used in computing net loss per share, basic and diluted	194,000	99,632
Net loss per share, basic and diluted	$ (0.56)	$ (0.99)

The following common stock equivalents have been excluded from diluted net loss per share because their inclusion would be anti-dilutive (in thousands):

	Three Months Ended March 31,	
	2021	2020
hares of common stock subject to outstanding options	4,679	3,478
hares of common stock subject to outstanding warrants	118	489
hares of common stock subject to outstanding RSUs and PRSUs	6,531	9,691
hares of common stock pursuant to ESPP	174	368
hares of common stock underlying Series A convertible preferred stock	125	125
hares of common stock subject to convertible senior notes conversion	11,770	11,770
Total shares of common stock equivalents	23,397	25,921

12. Geographic information

Revenue by country is determined based on the billing address of the customer. The following presents revenue by country (in thousands):

	Three Months Ended March 31,	
	2021	2020
United States	$ 90,412	$ 59,806
Rest of world	13,209	4,442
Total revenue	$ 103,621	$ 64,248

13. Subsequent events

Genosity

In April 2021, we acquired 100% of the fully diluted equity of Genosity Inc. ("Genosity"), a genomics and laboratory services company offering software and laboratory solutions that enable development and deployment of complex sequencing based tests for approximately $200.0 million, consisting of approximately $120.0 million in cash and approximately $80.0 million in shares of our common stock based on a trailing average closing price prior to the date of closing. In connection with this transaction, we granted RSUs having a value of up to $15.0 million to certain continuing employees.

Given the timing of the transaction with Genosity, we are currently in the process of valuing the assets acquired and liabilities assumed. As a result, we are not yet able to provide the amounts to be recognized as of the acquisition date for the major classes of assets acquired and liabilities assumed and other related disclosures. We will disclose this and other related information in our Quarterly Report on Form 10-Q for the period ending June 30, 2021.

Convertible senior notes

In April 2021, we issued, at 99% of par value, $1.2 billion aggregate principal amount of 1.5% convertible senior notes due 2028 (the "2028 Notes") in a private offering. The 2028 Notes are our senior unsecured obligations and will mature on April 1, 2028, unless earlier converted, redeemed or repurchased. The 2028 Notes bear cash interest at a rate of 1.5% per year, payable semi-annually in arrears on April 1 and October 1 of each year, beginning on October 1, 2021. Upon conversion, the 2028 Notes will be convertible into cash, shares of our common stock or a combination of cash and shares of our common stock, at our election. The initial conversion rate for the 2028 Notes is 23.1589 shares of our common stock per $1,000 principal amount of the 2028 Notes (equivalent to an initial conversion price of approximately $43.18 per share of common stock), and the conversion rate is subject to customary anti-dilution and other adjustments as a result of certain extraordinary transactions. Further information regarding the 2028 Notes will be provided in our Quarterly Report on Form 10-Q for the period ending June 30, 2021.

Leases

In April 2021, we entered into a lease agreement for a new 250,000 square foot laboratory and production facility in North Carolina for an initial lease term of 160 months estimated to commence on December 1, 2021. We will recognize the related right-of-use asset and lease liability when we have obtained the right to use the facility, which we currently expect to occur in the second or third quarter of 2021. Upon execution of the lease in April 2021, we have agreed to deliver to the lessor a sum of $2.6 million, consisting of a security deposit and one month's rent.

ITEM 2. Management's Discussion and Analysis of Financial Condition and Results of Operations.

The following discussion of our financial condition and results of operations should be read in conjunction with our condensed consolidated financial statements and the related notes included in Item 1 of Part I of this report, and together with our audited consolidated financial statements and the related notes included in our Annual Report on Form 10-K for the year ended December 31, 2020. Historic results are not necessarily indicative of future results.

This report contains forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. All statements in this report other than statements of historical fact, including statements identified by words such as "believe," "may," "will," "estimate," "continue," "anticipate," "intend," "expect" and similar expressions, are forward-looking statements. Forward-looking statements include, but are not limited to, statements about:

- our views regarding the future of genetic testing and its role in mainstream medical practice;
- the impact of COVID-19 on our business and the actions we have taken or may take in response thereto;
- our mission and strategy for our business, products and technology, including our ability to expand our content and develop new content while maintaining attractive pricing, further enhance our genetic testing service and the related user experience, build interest in and demand for our tests and attract potential partners;
- the implementation of our business model;
- the expected benefits from and our ability to integrate our acquisitions;
- the rate and degree of market acceptance of our tests and genetic testing generally;
- our ability to scale our infrastructure and operations in a cost-effective manner;
- the timing of and our ability to introduce improvements to our genetic testing platform and to expand our assays to include additional genes;
- the timing and results of studies with respect to our tests;
- developments and projections relating to our competitors and our industry;
- our competitive strengths;
- the degree to which individuals will share genetic information generally, as well as share any related potential economic opportunities with us;
- our commercial plans, including our sales and marketing expectations as well as our ability to expand internationally;
- our ability to obtain and maintain adequate reimbursement for our tests;
- regulatory developments in the United States and foreign countries;
- our ability to attract and retain key scientific or management personnel;
- our expectations regarding our ability to obtain and maintain intellectual property protection and not infringe on the rights of others;
- our ability to obtain funding for our operations and the growth of our business, including potential acquisitions;
- our financial performance;
- the impact of accounting pronouncements and our critical accounting policies, judgments, estimates and assumptions on our financial results;
- our expectations regarding our future revenue, cost of revenue, operating expenses and capital expenditures, and our future capital requirements; and
- the impact of tax laws on our business.

Forward-looking statements are subject to a number of risks and uncertainties that could cause actual results to differ materially from those expected. These risks and uncertainties include, but are not limited to, those risks discussed in Item 1A of Part II of this report. Although we believe that the expectations and assumptions reflected in the forward-looking statements are reasonable, we cannot guarantee future results, level of activity, performance or achievements. In addition, neither we nor any other person assumes responsibility for the accuracy and completeness of any of these forward-looking statements. Any forward-looking statements in this report speak only as of the date of this report. We expressly disclaim any obligation or undertaking to update any forward-looking statements.

This report contains statistical data and estimates that we obtained from industry publications and reports. These publications typically indicate that they have obtained their information from sources they believe to be reliable, but do not guarantee the accuracy and completeness of their information. Some data contained in this report is also based on our internal estimates. Although we have not independently verified the third-party data, we believe it to be reasonable.

In this report, all references to “Invitae,” “we,” “us,” “our,” or “the Company” mean Invitae Corporation.

Invitae and the Invitae logo are trademarks of Invitae Corporation. We also refer to trademarks of other companies and organizations in this report.

Mission and strategy

Invitae’s mission is to bring comprehensive genetic information into mainstream medical practice to improve the quality of healthcare for billions of people. Our goal is to aggregate a majority of the world’s genetic information into a comprehensive network that enables sharing of data among network participants to improve healthcare and clinical outcomes.

We were founded on four core principles:

- Patients should own and control their own genetic information;
- Healthcare professionals are fundamental in ordering and interpreting genetic information;
- Driving down the price of genetic information will increase its clinical and personal utility; and
- Genetic information is more valuable when shared.

Our strategy for long-term growth centers on five key drivers of our business, which we believe work in conjunction to create a flywheel effect extending our leadership position in the new market we are building:

- **Expanding our content offering.** We intend to continue steadily adding additional testing and analysis content to the Invitae platform, ultimately leading to affordable and ongoing access to the molecular information that enables personalized medicine. The breadth and depth of our offering is a core and central contribution to an improved user experience.

- **Creating a unique user experience.** A state-of-the-art interactive platform will enhance our service offering, leverage the uniquely empowering characteristics of online sharing of genetic information and, we believe, enable a superior economic offering to clients. We intend to continue to expend substantial efforts developing, acquiring and implementing technology-driven improvements to our customers' experience. We believe that an enhanced user experience and the resulting benefits to our brand and reputation will help draw customers to us over and above our direct efforts to do so.
- **Driving volume.** We intend to increase our brand equity and visibility through a commitment to precision testing results, excellent service and a variety of education, marketing and promotional techniques, including scientific publications and presentations, sales, marketing, public relations, social media and web technology vehicles. We believe that rapidly increasing the number of customers using our platform helps us to attract partners.
- **Attracting partners.** As we add more customers to our platform, we believe our business becomes particularly attractive to potential partners that can help the patients in our network further benefit from their genetic information or that provide us access to new customers who may wish to join our network. We believe the cumulative effect of the increased volume brought by these strategic components will allow us to lower the cost of our service and expand patient access globally.
- **Lowering the cost and price of genetic information.** Our goal is to provide customers with a broad menu of genetic content at a reasonable price and rapid turn-around times in order to grow volume and, in turn, achieve greater economies of scale. As our customers and our business benefit from further cost savings, we expect that those cost savings will allow us to deliver still more comprehensive information at decreasing prices and further improve the customer experience, allowing us to reap the cumulative benefits from all of the efforts outlined above.

We seek to differentiate our service in the market by establishing an exceptional experience for our customers. To that end, we believe that elevating the needs of the customer over those of our other stakeholders is essential to our success. Thus, in our decision-making processes, we strive to prioritize, in order:

- The needs of our customers;
- Motivating our employees to serve our customers; and
- Our long-term stockholder value.

We are certain that focusing on customers as our top priority rather than short-term financial goals is the best way to build and operate an organization for maximum long-term value creation.

Business overview

We offer high-quality, comprehensive, affordable genetic testing across multiple clinical areas, including hereditary cancer, cardiology, neurology, pediatrics, personalized oncology, metabolic conditions and rare diseases. To augment our offering and realize our mission, we have acquired multiple assets and businesses, which expanded our suite of genome management offerings and established a broader entry into key genomics markets.

This year we completed the acquisition of Reference Genomics, Inc. d/b/a One Codex, or One Codex, and Genosity, Inc., or Genosity. One Codex is a data platform for applied microbial genomics. Its acquisition adds capabilities across microbiome and infectious disease testing capabilities and allows us to deliver a high-quality, low-cost, end-to-end metagenomics product (sequencing and results) and enables the development of future offerings in infectious disease, preterm birth and wellness.

Genosity is a genomics and laboratory services company offering software and laboratory solutions that enable the deployment of complex sequencing-based cancer testing. The acquisition brings Genosity's specialized capabilities onto the Invitae platform to accelerate the time to market and decentralization of Invitae's personalized oncology offerings, including somatic and germline offerings used in screening, therapy selection and personalized cancer monitoring.

We have experienced rapid growth. For the years ended December 31, 2020, 2019 and 2018, our revenue was $279.6 million, $216.8 million, and $147.7 million, respectively, and we incurred net losses of $602.2 million, $242.0 million, and $129.4 million, respectively. For the three months ended March 31, 2021 and 2020, our revenue was $103.6 million and $64.2 million, respectively, and we incurred net losses of $109.5 million and $98.5 million, respectively. At March 31, 2021, our accumulated deficit was $1.5 billion. To meet the demands of scaling our business, we increased our number of employees to approximately 2,300 at March 31, 2021 from approximately 1,500 on March 31, 2020. Our sales force consisted of approximately 300 employees at March 31, 2021 and March 31, 2020.

Sales of our tests have grown significantly. In 2020, 2019 and 2018, we generated 659,000, 469,000 and 292,000 billable units, respectively. In the three months ended March 31, 2021, we generated 259,000 billable tests compared to 151,000 billable tests in the same period in 2020. We calculate volume using billable units, which are billable events that include individual test reports released and individual reactions shipped. We refer to the set of reagents needed to perform an NGS test as a "reaction." Approximately 58% of the billable volume generated in the first three months of 2021 were billable to patients, biopharmaceutical partners and other business-to-business customers (e.g., hospitals, clinics, medical centers), and the remainder were billable to third-party payers. Many of the gene tests on our assays are tests for which insurers reimburse. However, when we do not have reimbursement policies or contracts with private insurers, our claims for reimbursement may be denied upon submission, and we must appeal the claims. The appeals process is time consuming and expensive, and may not result in payment. Even if we are successful in achieving reimbursement, we may be paid at lower rates than if we were under contract with the third-party payer. When there is not a contracted rate for reimbursement, there is typically a greater payment requirement from the patient that may result in further delay in payment for these tests.

We expect to incur operating losses for the near term as we continue to invest in our business to achieve our revenue growth objectives, including expansion of our platform to capture the broad potential of genetics across healthcare, and may need to raise additional capital in order to fund our operations. If we are unable to achieve these objectives and successfully manage our costs, we may not be able to achieve profitability in the near term or at all.

We believe that the keys to our future growth will be to increase billable volume, achieve broad reimbursement coverage for our tests from third-party payers, drive down the price for genetic analysis and interpretation, steadily increase the amount of genetic content we offer, consistently improve the client experience, drive physician and patient utilization of our website for ordering and delivery of results and increase the number of strategic partners working with us to add value for our clients. We also believe that providing a unique genetic testing platform that is agnostic to stage of life or disease category will deliver unique benefits to customers, payers and other institutions that are seeking to make genetic information a standard element of healthcare decisions in the future.

Impact of COVID-19

Our test volumes decreased significantly in the second half of March 2020 as compared to the first few months of 2020 as a result of COVID-19 and related limitations and priorities across the healthcare system. Our daily volumes have consistently increased from the low in March 2020, although we are currently still experiencing changes in product mix due to the impact of COVID-19. COVID-19 could have a material impact on our financial results for the foreseeable future, particularly on product mix and as a result, the revenue we recognize. We have reviewed and adjusted for the impact of COVID-19 on our estimates related to revenue recognition and expected credit losses.

In response to the pandemic we have implemented measures to protect the health of all of our employees during this time with additional measures in place to better protect our on-site lab production and support teams. Our production facilities currently remain fully operational. While we have not experienced significant disruption in our supply chain, we have experienced supply delays as a result of the COVID-19 pandemic and have also had to obtain supplies from new suppliers. Although we do not yet know the full impact COVID-19 will have on our supply chain, we have increased our inventory on hand to respond to potential future disruptions that may occur.

Many announced healthcare guidelines call for a shift of regular physician visits and healthcare delivery activities to remote/telehealth formats. This is particularly important for patients who, despite the fall-out from COVID-19, continue to be diagnosed with critical diseases, like cancer, and for women who are pregnant or are trying to conceive. We believe our investments in new access platforms and technologies has and will continue to position us well to provide a range of testing to clinicians and patients using a “clinical care from afar” model. An example is our rollout in April 2020 of our Gia telehealth platform, which expands access to remote interaction between patients and clinicians as well as direct ordering of genetic tests. Such access helped to counteract some of the adverse in-office impacts of COVID-19, allowing continuation of key testing categories in a safe environment.

Given the unknown duration and extent of COVID-19’s impact on our business, and the healthcare system in general, we adapted our spending and investment levels in 2020 and continue to monitor evolving market conditions, including focusing commercial execution on workflows that support remote ordering, online support and telehealth.

In March 2020, the Coronavirus Aid, Relief, and Economic Security Act, or CARES Act, was signed into law which was a stimulus bill intended to bolster the economy, among other things, and provide assistance to qualifying businesses and individuals. The CARES Act included an infusion of funds into the healthcare system; in April 2020, we received $3.8 million as a part of this initiative, and in January 2021, we received an additional $2.3 million. These payments were recognized as other income, net in our consolidated statement of operations in the period received. At this time, we are not certain of the availability, extent or impact of any future relief provided under the CARES Act.

Factors affecting our performance

Number of billable units

Our centralized test revenue is tied to the number of tests which we bill third-party payers, biopharmaceutical partners, other business-to-business customers (e.g., hospitals, clinics, medical centers), or patients. Our decentralized product revenue is tied to the number of individual reactions we ship biopharmaceutical partners and other business-to-business customers. We refer to the set of reagents needed to perform an NGS test as a "reaction," and we refer to billable events that include individual test reports released and individual reactions shipped as billable units. We typically bill for our services following delivery of the billable report derived from testing samples and interpreting the results. For units manufactured for use by customers in distributed facilities, we typically bill customers upon shipment of those units. Test orders are placed under signed requisitions or contractual agreements, as we often enter into contracts with biopharmaceutical partners, other business-to-business customers and insurance companies that include pricing provisions under which such tests are billed. We incur the expenses associated with a unit in the period in which the unit is processed regardless of when payment is received with respect to that unit. We believe the number of billable units in any period is an important indicator of the growth in our testing business, and with time, this will translate into the number of customers accessing our platform.

Number and size of research and commercial partnerships

Pharma development services revenue, which we recognize within other revenue in our consolidated statements of operations, is generated primarily from services provided to biopharmaceutical companies and other partners and is related to companion diagnostic development, clinical research, and clinical trial services across the research, development and commercialization phases of collaborations. The result of these relationships may include the development of new targeted companion diagnostics, which underscore and expand the need for genetic testing and in some cases may lead to intellectual property and/or revenue sharing opportunities with third-party partners.

In addition to research partnerships, we also seek to grow the number of biopharmaceutical partners and other business-to-business customers for whom we provide testing technologies, analysis, supplies and expertise to institutions that provide independent testing services to customers in their respective regions.

Success obtaining and maintaining reimbursement

Our ability to increase volume and revenue will depend in part on our success achieving broad reimbursement coverage and laboratory service contracts for our tests from third-party payers and agreements with institutions and partners. Reimbursement may depend on a number of factors, including a payer's determination that a test is appropriate, medically necessary and cost-effective, as well as whether we are in contract, where we get paid more consistently and at higher rates. Because each payer makes its own decision as to whether to establish a policy or enter into a contract to reimburse for our testing services and specific tests, seeking these approvals is a time-consuming and costly process. In addition, clinicians and patients may decide not to order our tests if the cost of the test is not covered by insurance. Because we require an ordering physician to requisition a test, our revenue growth also depends on our ability to successfully promote the adoption of our testing services and expand our base of ordering clinicians. We believe that establishing coverage and obtaining contracts from third-party payers is an important factor in gaining adoption by ordering clinicians. Our arrangements for laboratory services with payers cover approximately 315 million lives, comprised of Medicare, all national commercial health plans, and Medicaid in most states, including California (Medi-Cal), our home state.

Ability to lower the costs associated with performing our tests

Reducing the costs associated with performing our genetic tests is both a focus and a strategic objective of ours. Over the long term, we will need to reduce the cost of raw materials by improving the output efficiency of our assays and laboratory processes, modifying our platform-agnostic assays and laboratory processes to use materials and technologies that provide equal or greater quality at lower cost, improve how we manage our materials, port some tests onto a next generation sequencing platform and negotiate favorable terms for our materials purchases. Our acquisition of Singular Bio, Inc. is a component of this objective, and we expect the technology acquired in this transaction, once developed, to help decrease the costs associated with our NIPS offering. We also intend to continue to design and implement hardware and software tools that are designed to reduce personnel-related costs for both laboratory and clinical operations/medical interpretation by increasing personnel efficiency and thus lowering labor costs per test. Finally, we plan to reduce the cost of providing test equipment and software to laboratories and other facilities in the U.S. and internationally. Those efforts are designed to enable a more rapid expansion of genetic testing and patient access, enlarging our geographic footprint outside the U.S. while achieving lower costs.

Ability to expand our genetic content and create new pathways to test

We believe our focus on reducing the average cost per test will have a countervailing force — increasing the number of tests we offer, the content of each test and the means to connect our testing services with patients and physicians. We intend to continue to expand our test menus by steadily releasing additional genetic content for the same or lower prices per test, ultimately leading to affordable whole genome services. The breadth and flexibility of our offering will be a critical factor in our ability to address new markets, including internationally, for genetic testing services. Both of these, in conjunction with our continued focus on strategic partnerships, will be important to our ability to continue to grow the volume of billable tests we deliver. We have and will continue to identify new ways to connect our testing services and information to patients. These include direct patient outreach and ordering capacity, the use of automated assistants for physician customers to improve the ease of ordering and processing genetic tests and programs designed to reach underserved patient populations with genetic testing.

Investment in our business and timing of expenses

We plan to continue to invest in our genetic testing and information management business. We deploy state-of-the-art technologies in our genetic testing services, and we intend to continue to scale our infrastructure, including our testing capacity and capabilities as well as our information systems. We also expect to incur software development costs as we seek to further automate our laboratory processes and our genetic interpretation and report sign-out procedures, scale our customer service capabilities to improve our customers' experience, and expand the functionality of our website. We also expect to incur costs as we seek to provide the testing equipment and software necessary to enable decentralized genetic and genomic testing in the U.S. and internationally. We will incur costs related to marketing and branding as we spread our initiatives beyond our current customer base and focus on providing access to customers through our website. We plan to hire additional personnel as necessary to support anticipated growth, including software engineers, sales and marketing personnel, billing personnel, research and development personnel, medical specialists, biostatisticians and geneticists. We will also incur additional costs related to the expansion of our production facilities to accommodate growth and as we expand domestically and internationally, including increased operating costs and capital expenditures related to the buildout

of our new laboratory and production facility in North Carolina. In addition, we will incur ongoing expenses as a result of operating as a public company. The expenses we incur may vary significantly by quarter as we focus on building out different aspects of our business.

How we recognize revenue

We generally recognize revenue on an accrual basis, which is when a customer obtains control of the promised goods or services, typically a test report. Accrual amounts recognized are based on estimates of the consideration that we expect to receive, and such estimates are adjusted and subsequently recorded until fully settled. Changes to such estimates may increase or decrease revenue recognized in future periods. Revenue from our tests may not be equal to billed amounts due to a number of factors, including differences in reimbursement rates, the amounts of patient payments, the existence of secondary payers and claim denials. Some test orders are placed under signed requisitions or contractual agreements, and we often enter into contracts with biopharmaceutical partners, other business-to-business customers and insurance companies that include pricing provisions under which such tests are billed.

Pharma development service revenues are generated primarily from custom assay design services, sample processing activities and consultative inputs, which is separate from revenue generated by any related or unrelated product component. Revenue is recognized as samples are processed or scope of work is completed based on contracted agreements with those biopharmaceutical customer companies.

Under these collaborations we also generate revenue from achievement of milestones, provision of on-going support, and related pass-through costs and fees. We generally have distinct performance obligations for development milestones related to our development of a companion diagnostic device. We use a cost plus a margin approach to estimate the standalone value of our companion diagnostic development service performance obligations. Revenue is recognized over time using input or output methods based on our assessments of performance completed to date toward each milestone.

Financial overview

Revenue

We primarily generate revenue from testing services and sales of distributed precision oncology products. Customers are typically billed upon delivery of test results or shipment of products. We also generate revenue from development agreements with biopharmaceutical customers. Our ability to increase our revenue will depend on our ability to increase our market penetration, obtain FDA and other international regulatory authority approvals on future products and services offerings, obtain contracted reimbursement coverage from third-party payers, and grow our relationships with biopharmaceutical customers.

Cost of revenue

Cost of revenue reflects the aggregate costs incurred in delivering our products and services and includes expenses for materials and supplies, personnel-related costs, freight, costs for lab services and clinical trial support, equipment and infrastructure expenses and allocated overhead including rent, information technology, equipment depreciation, amortization of acquired intangibles, and utilities. We expect cost of revenue to generally increase in line with the increase in billable volume, however, we expect a future increase in amortization of acquired intangible assets that is not dependent on billed volume. We anticipate our cost per unit for existing tests will generally decrease over time due to the efficiencies we expect to gain as volume increases and from automation and other cost reductions. These reductions in cost per unit will likely be offset by new offerings which often have a higher costs per unit during the introductory phases before we are able to gain efficiencies. The cost per unit may fluctuate significantly from quarter to quarter.

Operating expenses

Our operating expenses are classified into three categories: research and development, selling and marketing, and general and administrative. For each category, the largest component is generally personnel-related costs, which include salaries, employee benefit costs, bonuses, commissions, as applicable, and stock-based compensation expense.

Research and development

Research and development expenses represent costs incurred to develop our technology and future offerings. These costs are principally for process development associated with our efforts to expand the number of genes we can evaluate, our efforts to lower the costs per unit and our development of new products to expand our platform. We have and may continue to partner with other companies to develop new technologies and capabilities; we expect to invest capital and incur significant operating costs to support these development efforts. In addition, we incur process development costs to further develop the software we use to operate our laboratories, analyze generated data, process customer orders, validate clinical activities, enable ease of customer ordering, deliver reports and automate our business processes. These costs consist of personnel-related costs, including stock-based compensation, laboratory supplies and equipment expenses, consulting costs, amortization of acquired intangible assets, and allocated overhead including rent, information technology, equipment depreciation and utilities.

We expense all research and development costs in the periods in which they are incurred. We expect our research and development expenses to significantly increase as we continue our efforts to develop additional offerings, make investments to reduce costs, streamline our technology to provide patients access to testing, scale our business domestically and internationally and acquire and integrate new technologies.

Selling and marketing

Selling and marketing expenses consist of personnel-related costs, including commissions, client service expenses, advertising and marketing expenses, educational and promotional expenses, market research and analysis, and allocated overhead including rent, information technology, equipment depreciation, amortization of acquired intangibles, and utilities. We expect our selling and marketing expenses to increase as we continue to build our brand and focus on advertising our products and services.

General and administrative

General and administrative expenses include executive, finance and accounting, billing and collections, legal and human resources functions as well as other administrative costs. These expenses include personnel-related costs; audit, accounting and legal expenses; consulting costs; allocated overhead including rent, information technology, equipment depreciation, and utilities; costs incurred in relation to our co-development agreements; changes in the fair value of contingent consideration related to our acquisitions; and post-combination expenses incurred in relation to companies we acquire. We expect our general and administrative expenses to increase as we support continued growth of operations.

Other income, net

Other income, net, primarily consists of adjustments to the fair value of our stock payable liabilities arising from business combinations, and we expect it to fluctuate significantly from period to period due to the volatility of our common stock. Other income, net also includes income generated from our cash equivalents and marketable securities and amounts received under the CARES Act.

Interest expense

Interest expense is primarily attributable to interest incurred related to our debt and finance leases. See Note 8, “Commitments and contingencies” in Notes to Consolidated Financial Statements in Part I, Item 1 of this Quarterly Report for more details.

Income tax benefit

Since we generally establish a full valuation allowance against our deferred tax balances, our income tax benefit primarily consists of tax impacts of our deferred income tax assessments resulting from our acquisitions.

Critical accounting policies and estimates

Management's discussion and analysis of our financial condition and results of operations is based on our consolidated financial statements, which have been prepared in accordance with U.S. generally accepted accounting principles, or U.S. GAAP. The preparation of these financial statements requires us to make judgments, estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the date of the financial statements, as well as the reported revenue generated and expenses incurred during the reporting periods. We evaluate our estimates on an ongoing basis. Our estimates are based on current facts, our historical experience and on various other factors that we believe are reasonable under the circumstances, the results of which form the basis for making judgments about the carrying value of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates under different assumptions or conditions and any such differences may be material. We believe that our accounting policies are critical to understanding our historical and future performance, as these policies relate to the more significant areas involving management's judgments and estimates.

There have been no material changes to our critical accounting policies and estimates as compared to the critical accounting policies and estimates described in our Annual Report on Form 10-K for the fiscal year ended December 31, 2020. See Note 2, "Summary of significant accounting policies" in the Notes to Condensed Consolidated Financial Statements for information regarding recent accounting pronouncements.

Results of operations

Three Months Ended March 31, 2021 and 2020

The following sets forth our consolidated statements of operations data for each of the periods indicated (in thousands, except percentage changes). Our historical results are not necessarily indicative of our results of operations to be expected for any future period.

	Three Months Ended March 31,		Dollar Change	% Change
	2021	2020		
Revenue:				
Test revenue	$ 99,276	$ 63,078	$ 36,198	57%
Other revenue	4,345	1,170	3,175	271%
Total revenue	103,621	64,248	39,373	61%
Cost of revenue	75,491	40,422	35,069	87%
Research and development	80,358	55,668	24,690	44%
Selling and marketing	51,240	42,120	9,120	22%
General and administrative	8,896	23,822	(14,926)	(63)%
Loss from operations	(112,364)	(97,784)	(14,580)	15%
Other income, net	4,465	4,708	(243)	(5)%
Interest expense	(8,393)	(5,451)	(2,942)	54%
Net loss before taxes	(116,292)	(98,527)	(17,765)	18%
Income tax benefit	(6,800)	—	(6,800)	(100)%
Net loss	$ (109,492)	$ (98,527)	$ (10,965)	11%

Revenue

The increase in total revenue of $39.4 million for the three months ended March 31, 2021 compared to the same period in 2020 was due primarily to increased billable volume as well as product mix and pricing due to growth in our business as well as due to businesses acquired. Billable volume increased to approximately 259,000 in the three months ended March 31, 2021 compared to 151,000 in the same period of 2020, an increase of 72 percent. Average revenue per unit decreased to $383 per unit in the three months ended March 31, 2021 compared to $418 per unit in the comparable prior period primarily due to changes in payer and product mix, the impact of business acquisitions and reductions in pricing for some payers as we focus on providing cost effective genetic testing.

Cost of revenue

The increase in the cost of revenue of $35.1 million for the three months ended March 31, 2021 compared to the same period in 2020 was primarily due to increased costs per unit as well as increased billable volume and the impact of business acquisitions, partially offset by the effect of cost efficiencies. For the three months ended March 31, 2021, billable volume increased to 259,000 from 151,000 for the same period in 2020. Cost per unit was $290 in the three months ended March 31, 2021 compared to $268 for the same period in 2020. The cost per unit increased primarily due to an increase in amortization of acquired intangible assets of $7.2 million as well as changes in product mix. These increases were partially offset by production improvements and capabilities which resulted in material efficiencies and automation and software improvements which reduced the cost per unit.

Research and development

The increase in research and development expense of $24.7 million for the three months ended March 31, 2021 compared to the same period in 2020 was due to growth in the business as well as impact of business acquisitions and primarily relates to increases in personnel-related expenses of $10.8 million primarily due to increases in headcount, $8.3 million in lab-related expenses due primarily to increased costs related to lab services and supplies, $3.7 million in professional fees, $2.0 million in technology costs, and $1.8 million in depreciation and amortization costs. These increases were partially offset by a $2.2 million increase in allocations from research and development to cost of revenue to support the increase in production volumes.

Selling and marketing

The increase in selling and marketing expense of $9.1 million for the three months ended March 31, 2021 compared to the same period in 2020 was due primarily to the growth of the business and principally consisted of increases in personnel-related costs of $10.5 million primarily reflecting increased headcount and includes an increase in sales commissions of $2.0 million, and an increase in depreciation and amortization expense of $0.9 million, partially offset by reduced travel-related costs of $2.1 million due to reductions in spending in response to COVID-19 and a decrease in marketing costs of $1.1 million.

General and administrative

The decrease in general and administrative expense of $14.9 million for the three months ended March 31, 2021 compared to the same period in 2020 was due primarily to fair value adjustments to reduce our acquisition-related liability representing the remaining ArcherDX development milestones of $63.7 million and an increase of $3.1 million in allocations of technology and facilities-related expenses to other functional areas.

These costs were partially offset by growth in the business which resulted in an increase in personnel-related costs by $39.2 million, which includes an increase in stock-based compensation of $33.2 million primarily due to the acceleration of certain awards granted through our acquisition of ArcherDX; a $4.2 million increase in legal and accounting services which was primarily due to increased acquisition-related transaction costs; an increase in post-combination expense of $3.7 million due to our acquisition of One Codex in February 2021; a $2.5 million increase in occupancy expense; and a $2.1 million increase in information technology expenses for software licenses and related expenses.

Other income, net

The decrease in other income, net of $0.2 million for the three months ended March 31, 2021 compared to the same period in 2020 was due principally to net changes in amounts recognized related to our marketable securities offset by $2.3 million received under the CARES Act in January 2021.

Interest expense

The increase in interest expense of $2.9 million for the three months ended March 31, 2021 compared to the same period in 2020 was primarily due to increased debt outstanding compared to the prior year period partially offset by the impact of the adoption of ASU 2020-06 which reduced the interest expense recognized related to our convertible senior notes during 2021.

Income tax benefit

The increase in income tax benefit of $6.8 million was primarily due to the net deferred tax liabilities assumed in connection with our acquisition of One Codex during February 2021, while there was no similar income tax benefit in the prior year period.

Liquidity and capital resources

Liquidity and capital expenditures

We have incurred net losses since our inception. For the three months ended March 31, 2021 and 2020, we had net losses of $109.5 million and $98.5 million, respectively, and we expect to incur additional losses in the future. At March 31, 2021, we had an accumulated deficit of $1.5 billion. While our revenue has increased over time, we may never achieve revenue sufficient to offset our expenses.

Since inception, our operations have been financed primarily by fees collected from our customers, net proceeds from sales of our capital stock as well as borrowing from debt facilities and the issuance of convertible senior notes.

In April 2020, we issued, in an underwritten public offering, an aggregate of 20.4 million shares of our common stock at a price of $9.00 per share, for gross proceeds of $184.0 million and net proceeds of approximately $173.0 million. In 2020, we issued approximately 3.6 million shares of common stock at an average price of $26.33 per share in an "at the market" offering for aggregate proceeds of $93.7 million and net proceeds of $90.7 million. In January 2021, we issued, in an underwritten public offering, an aggregate of 8.9 million shares of our common stock at a price of $51.50 per share, for gross proceeds of $460.0 million and net proceeds of approximately $434.3 million.

In September 2019, we issued $350.0 million of aggregate principal amount of convertible senior notes due 2024, which bear cash interest at a rate of 2.0% per year. Also in September 2019, we used the funds received through the issuance of our convertible senior notes due 2024 to settle our Note Purchase Agreement we entered into in November 2018. In April 2021, we issued $1.2 billion of aggregate principal amount of convertible senior notes due 2028, which bear cash interest at a rate of 1.5% per year.

In October 2020 in connection with our acquisition of ArcherDX, we issued $275.0 million of our common stock in a private placement at a price of $16.85 per share to a syndicate of life sciences investors. We also entered into a credit facility to borrow $135.0 million. The private placement and credit facility closed concurrently with the merger in October 2020. In connection with the credit facility, we issued warrants to purchase 1.0 million shares of our common stock at an exercise price of $16.85 per share which were exercised in October 2020 on a net exercise basis. The terms of this credit facility restrict our ability to incur certain indebtedness, pay dividends, make acquisitions and take other actions.

At March 31, 2021 and December 31, 2020, we had $681.9 million and $360.7 million, respectively, of cash, cash equivalents, restricted cash and marketable securities.

Our primary uses of cash are to fund our operations as we continue to grow our business, enter into partnerships and potentially to acquire businesses and technologies. Cash used to fund operating expenses is affected by the timing of when we pay expenses, as reflected in the change in our outstanding accounts payable and accrued expenses.

We have incurred substantial losses since inception, and we expect to continue to incur losses in the future. We believe our existing cash, cash equivalents and marketable securities as of March 31, 2021 and fees collected from the sale of our products and services will be sufficient to meet our anticipated cash requirements for the foreseeable future.

We may need or choose to raise additional funding to finance operations prior to achieving profitability or should we make additional acquisitions. We regularly consider fundraising opportunities and will determine the timing, nature and size of future financings based upon various factors, including market conditions and our operating plans. We may in the future elect to finance operations by selling equity or debt securities or borrowing money. We also may elect to finance future acquisitions. If we issue equity securities, dilution to stockholders may result. Any equity securities issued may also provide for rights, preferences or privileges senior to those of holders of our common stock. If we raise funds by issuing additional debt securities, these debt securities would have rights, preferences and privileges senior to those of holders of our common stock. In addition, the terms of additional debt securities or borrowings could impose significant restrictions on our operations. If additional funding is required, there can be no assurance that additional funds will be available to us on acceptable terms on a timely basis, if at all. If we are unable to obtain additional funding when needed, we may need to curtail planned activities to reduce costs. Doing so will likely have an unfavorable effect on our ability to execute on our business plan and have an adverse effect on our business, results of operations and future prospects.

The following table summarizes our cash flows (in thousands):

	Three Months Ended March 31,	
	2021	2020
Net cash used in operating activities	$ (89,520)	$ (62,360)
Net cash provided by (used in) investing activities	(273,558)	800
Net cash provided by financing activities	436,091	551
Net increase (decrease) in cash, cash equivalents and restricted cash	$ 73,013	$ (61,009)

Cash flows from operating activities

For the three months ended March 31, 2021, cash used in operating activities of $89.5 million principally resulted from our net loss of $109.5 million, non-cash charges of remeasurements of liabilities in connection with business combinations of $67.0 million primarily relating to ArcherDX development milestones and a $6.8 million income tax benefit primarily generated from our acquisition of One Codex. These were partially offset by non-cash charges of $58.8 million for stock-based compensation, $16.6 million for depreciation and amortization, $3.0 million of post-combination expense related to the acceleration of unvested equity from our acquisition of One Codex and $2.7 million for amortization of debt discount and issuance costs related to our outstanding debt. The net effect on cash of changes in net operating assets was an increase of cash of $8.9 million.

For the three months ended March 31, 2020, cash used in operating activities of $62.4 million principally resulted from our net loss of $98.5 million, partially offset by non-cash charges of $29.3 million for stock-based compensation, $6.1 million for depreciation and amortization, $3.6 million for amortization of debt discount and issuance costs related to our convertible senior notes due 2024, and $3.4 million resulting from the remeasurements of liabilities associated with our business combinations. The net effect on cash of changes in net operating assets was an increase of cash of $1.2 million.

Cash flows from investing activities

For the three months ended March 31, 2021, cash used in investing activities of $273.6 million was due primarily to net purchases of marketable securities of $251.2 million, net cash used to acquire One Codex of $15.0 million and cash used for purchases of property and equipment of $6.4 million.

For the three months ended March 31, 2020, cash provided by investing activities of $0.8 million was due to net sales and maturities of marketable securities of $37.5 million partially offset by net cash used to acquire Diploid of $32.2 million and by cash used for purchases of property and equipment of $3.8 million.

Cash flows from financing activities

For the three months ended March 31, 2021, cash provided by financing activities of $436.1 million primarily consisted of net proceeds from the public offering of common stock of $434.3 million and cash received from issuances of common stock of $2.6 million.

For the three months ended March 31, 2020, cash provided by financing activities of $0.6 million consisted of cash received from issuances of common stock of $1.2 million, partially offset by finance lease payments of $0.6 million.

Contractual obligations

The following table summarizes our contractual obligations, including interest, as of March 31, 2021 (in thousands):

Contractual obligations:	Remainder of 2021	2022 and 2023	2024 and 2025	2026 and beyond	Total
Operating leases	$ 13,097	$ 35,194	$ 33,758	$ 34,975	$ 117,024
Finance leases	1,816	4,240	145	—	6,201
Convertible senior notes due 2024	—	—	350,000	—	350,000
2020 Term Loan	—	—	135,000	—	135,000
Purchase commitments	15,161	39,105	5,308	—	59,574
Total	$ 30,074	$ 78,539	$ 524,211	$ 34,975	$ 667,799

See Note 8, "Commitments and contingencies" in the Notes to Condensed Consolidated Financial Statements for additional details regarding our leases, convertible senior notes, 2020 Term Loan and purchase commitments.

Off-balance sheet arrangements

We have not entered into any off-balance sheet arrangements.

Recent accounting pronouncements

See “Recent accounting pronouncements” in Note 2, “Summary of significant accounting policies” in the Notes to Condensed Consolidated Financial Statements included elsewhere in this report for a discussion of recently adopted accounting pronouncements and accounting pronouncements not yet adopted, and their expected effect on our financial position and results of operations.

ITEM 3. Quantitative and Qualitative Disclosures About Market Risk.

We are exposed to market risks in the ordinary course of our business. These risks primarily relate to interest rates. Our cash, cash equivalents, restricted cash and marketable securities totaled $681.9 million at March 31, 2021, and consisted primarily of bank deposits, money market funds, U.S. treasury notes, and U.S. government agency securities. Such interest-bearing instruments carry a degree of risk; however, because our investments are primarily high-quality credit instruments with short-term durations with high-quality institutions, we have not been exposed to, nor do we anticipate being exposed to, material risks due to changes in interest rates. At March 31, 2021, a hypothetical 1.0% (100 basis points) increase or decrease in interest rates would not have resulted in a material change in the fair value of our cash equivalents and marketable securities. Fluctuations in the value of our cash equivalents and marketable securities caused by a change in interest rates (gains or losses on the carrying value) are recorded in other comprehensive gain (loss) and are realized if we sell the underlying securities prior to maturity.

Our 2020 Term Loan bears interest at an annual rate equal to three-month LIBOR, subject to a 2.00% LIBOR floor, plus a margin of 8.75% and is therefore sensitive to changes in interest rates. If three-month LIBOR can no longer be determined or if the applicable governmental authority ceases to supervise or sanction such rates, then we shall endeavor to agree with the administrative agent, an alternate rate of interest that gives due consideration to the then prevailing market convention for determining interest for comparable loans in the United States; provided that until such alternative rate of interest is agreed, the 2020 Term Loan shall bear interest at the Wall Street Journal Prime Rate. We currently do not use interest rate derivative instruments to manage our exposure to interest rate fluctuations.

Although our convertible senior notes due 2024 are based on a fixed rate, changes in interest rates could impact their fair market value. As of March 31, 2021, the fair market value of the convertible senior notes due 2024 was $527.1 million. For additional information about the convertible senior notes due 2024, see Note 8, “Commitments and contingencies” in Notes to Condensed Consolidated Financial Statements in Part I, Item 1 of this Quarterly Report.

ITEM 4. Controls and Procedures.

(a) Evaluation of disclosure controls and procedures

We maintain "disclosure controls and procedures," as such term is defined in Rule 13a-15(e) under the Securities Exchange Act of 1934, or Exchange Act, that are designed to ensure that information required to be disclosed by us in reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in Securities and Exchange Commission rules and forms, and that such information is accumulated and communicated to our management, including our principal executive officer and principal financial officer, as appropriate, to allow timely decisions regarding required disclosure. In designing and evaluating our disclosure controls and procedures, management recognized that disclosure controls and procedures, no matter how well conceived and operated, can provide only reasonable, not absolute, assurance that the objectives of the disclosure controls and procedures are met. Our disclosure controls and procedures have been designed to meet reasonable assurance standards. Additionally, in designing disclosure controls and procedures, our management necessarily was required to apply its judgment in evaluating the cost-benefit relationship of possible disclosure controls and procedures. The design of any disclosure controls and procedures also is based in part upon certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated goals under all potential future conditions.

Based on their evaluation as of the end of the period covered by this Quarterly Report on Form 10-Q, our Chief Executive Officer (our principal executive officer) and Chief Financial Officer (our principal financial officer) have concluded that, as of such date, our disclosure controls and procedures were effective at the reasonable assurance level.

(b) Changes in internal control over financial reporting

During the quarterly period covered by this Quarterly Report on Form 10-Q, there were no changes in our internal control over financial reporting that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

PART II — Other Information

ITEM 1. Legal Proceedings.

For discussion of legal matters as of March 31, 2021, see Note 8, "Commitments and contingencies" in Notes to Consolidated Financial Statements in Part I, Item 1 of this report, which is incorporated to this item by reference.

ITEM 1A. Risk Factors.

Risks related to our business and strategy

We face risks related to health epidemics, including the recent COVID-19 pandemic, which could have a material adverse effect on our business and results of operations.

Our business has been and could continue to be adversely affected by a widespread outbreak of contagious disease, including the recent pandemic of respiratory illness caused by a novel coronavirus known as COVID-19. Global health concerns relating to COVID-19 have negatively affected the macroeconomic environment, and the pandemic has significantly increased economic volatility and uncertainty.

The pandemic has resulted in government authorities implementing numerous measures to try to contain the virus, such as travel bans and restrictions, quarantines, shelter-in-place or stay-at-home orders, and business shutdowns. For example, some of our personnel located at our headquarters and other offices in California, elsewhere in the United States and in other countries, have been subject to shelter-in-place or stay-at-home orders from state and local governments. These measures have adversely impacted and may further impact our employees and operations and the operations of our customers, suppliers and business partners, and may continue to negatively impact spending patterns, payment cycles and insurance coverage levels. These measures have adversely affected and may continue to adversely affect demand for our tests. In 2020, many of our customers, including hospitals and clinics, suspended non-emergency appointments and services, which resulted in a significant decrease in our test volume. Travel bans, restrictions and border closures have also impacted our ability to ship tests to and receive samples from our customers. Some of these measures by government authorities have and may continue to remain in place for a significant period of time. Even if these measures are lifted, they may be implemented again if COVID-19 is not contained or returns, as has been the case recently. These measures have adversely affected and may continue to adversely affect our test volume, sales activities and results of operations.

The spread of COVID-19 has caused us to modify our business practices (including employee travel, mandating that all non-essential personnel work from home, temporary closures of our offices, cancellation of physical participation in sales activities, meetings, events and conferences and increasing inventories of certain supplies because, although we have not experienced significant disruption in our supply chain, we have experienced supply delays as a result of the COVID-19 pandemic and have also had to obtain supplies from new suppliers), and we may take further actions as may be required by government authorities or that we determine are in the best interests of our employees, customers and business partners. Such actions have impacted our ability to fully integrate businesses we have acquired and may impact those we may acquire in the future. There is no certainty that such actions will be sufficient to mitigate the risks posed by the virus or otherwise be satisfactory to government authorities. If significant portions of our workforce are unable to work effectively, including due to illness, quarantines, social distancing, government actions or other restrictions in connection with COVID-19, our operations will be impacted.

The extent to which COVID-19 continues to impact our business, results of operations and financial condition will depend on future developments, which are highly uncertain and cannot be predicted, including, but not limited to, the duration and spread of the pandemic, the actions to contain the virus and treat its impact, and how quickly and to what extent normal economic and operating activities can resume. COVID-19 could limit the ability of our customers, suppliers and business partners to perform, including third-party payers' ability to make timely payments to us during and following the pandemic. Some of our biopharmaceutical partners have been impacted by COVID-19, which has delayed certain programs and impacted the timing of our revenue. We have also experienced and may continue to experience a shortage of, or delays in, laboratory supplies and equipment, or a suspension of services from other laboratories or third parties. Even after COVID-19 has subsided, we may continue to experience an adverse impact to our business as a result of its global economic impact, including any recession that has occurred or may occur in the future, and loss of health insurance coverage resulting from pandemic-related job losses.

Specifically, difficult macroeconomic conditions, such as decreases in per capita income and level of disposable income, increased and prolonged unemployment or a decline in consumer confidence as a result of COVID-19, as well as limited or significantly reduced points of access of our tests, could have a material adverse effect on the demand for our tests. Under difficult economic conditions, consumers may seek to reduce discretionary spending by forgoing our tests. Decreased demand for our tests, particularly in the United States, has negatively affected and could continue to negatively affect our overall financial performance. Because a significant portion of our revenue is concentrated in the United States, where the impact of COVID-19 has been significant, COVID-19 has had and could continue to have a disproportionately negative impact on our business and financial results.

There are no comparable recent events which may provide guidance as to the effect of the spread of COVID-19 and a pandemic, and, as a result, the ultimate impact of COVID-19 or a similar health epidemic is highly uncertain and subject to change. We do not yet know the full extent of COVID-19's impact on our business, our operations, or the global economy as a whole. However, the effects could have a material impact on our results of operations, and we continue to monitor the situation closely.

To the extent the COVID-19 pandemic continues to adversely affect our business and financial results, it may also have the effect of heightening many of the other risks described in this section.

We expect to continue incurring significant losses, and we may not successfully execute our plan to achieve or sustain profitability.

We have incurred substantial losses since our inception. For the three months ended March 31, 2021 and 2020, our net losses were $109.5 million and $98.5 million, respectively. For the years ended December 31, 2020, 2019 and 2018, our net losses were $602.2 million, $242.0 million and $129.4 million, respectively. At March 31, 2021, our accumulated deficit was $1.5 billion. While our revenue has increased over time, we expect to continue to incur significant losses as we invest in our business. We incurred research and development expenses of $240.6 million, $141.5 million and $63.5 million in 2020, 2019 and 2018, respectively, and selling and marketing expenses of $168.3 million, $122.2 million and $74.4 million in 2020, 2019 and 2018, respectively. We expect these losses may increase as we focus on scaling our business and operations and expanding our testing capabilities, which may also increase our operating expenses, and we have experienced and may continue to experience decreases in test volume due to the impact of COVID-19. In addition, as a result of the integration of acquired businesses, we may be subject to unforeseen or additional expenditures, costs or liabilities, including costs and potential liabilities associated with litigation. Our prior losses and expected future losses have had and may continue to have an adverse effect on our stockholders' equity, working capital and stock price. Our failure to achieve and sustain profitability in the future would negatively affect our business, financial condition, results of operations and cash flows, and could cause the market price of our common stock to decline.

We began operations in January 2010 and commercially launched our initial assay in late November 2013; accordingly, we have a relatively limited operating history upon which you can evaluate our business and prospects. Our limited commercial history makes it difficult to evaluate our current business and makes predictions about our future results, prospects or viability subject to significant uncertainty. Our prospects must be considered in light of the risks and difficulties frequently encountered by companies in their early stage of development, particularly companies in new and rapidly evolving markets such as ours. These risks include an evolving and unpredictable business model and the management of growth. To address these risks, we must, among other things, increase our customer base; continue to implement and successfully execute our business and marketing strategy; identify, acquire and successfully integrate companies, assets or technologies in areas that are complementary to our business strategy; successfully enter into other strategic collaborations or relationships; obtain access to capital on acceptable terms and effectively utilize that capital; identify, attract, hire, retain, motivate and successfully integrate additional employees; continue to expand, automate and upgrade our laboratory, technology and data systems; obtain, maintain and expand coverage and reimbursement by healthcare payers; provide rapid test turnaround times with accurate results at low prices; provide superior customer service; and respond to competitive developments. We cannot assure you that we will be successful in addressing these risks, and the failure to do so could have a material adverse effect on our business, prospects, financial condition and results of operations.

Our inability to raise additional capital on acceptable terms in the future may limit our ability to develop and commercialize new tests and expand our operations.

We expect capital expenditures and operating expenses to increase over the next several years as we expand our infrastructure, commercial operations, research and development and selling and marketing activities and pursue and integrate acquisitions. We believe our existing cash and cash equivalents as of March 31, 2021, including the net proceeds from our recent public offering and revenue from sales of our tests will be sufficient to meet our anticipated cash requirements for our currently-planned operations for the foreseeable future. We may raise additional capital to finance operations prior to achieving profitability, or should we make additional acquisitions. We may seek to raise additional capital through equity offerings, debt financings, collaborations or licensing arrangements. Additional funding may not be available to us on acceptable terms, or at all. In addition, the terms of our credit agreement restrict our ability to incur certain indebtedness and issue certain equity securities. If we raise funds by issuing equity securities, dilution to our stockholders would result. Any equity securities issued also may provide for rights, preferences or privileges senior to those of holders of our common stock. The terms of debt securities issued or borrowings, if available, could impose significant restrictions on our operations.

The incurrence of additional indebtedness or the issuance of certain equity securities could result in increased fixed payment obligations and could also result in restrictive covenants, such as limitations on our ability to incur additional debt or issue additional equity, limitations on our ability to acquire companies or acquire or license intellectual property rights, and other operating restrictions that could adversely affect our ability to conduct our business. In addition, the issuance of additional equity securities by us, or the possibility of such issuance, may cause the market price of our common stock to decline. In the event we enter into collaborations or licensing arrangements to raise capital, we may be required to accept unfavorable terms. These agreements may require that we relinquish or license to a third party on unfavorable terms our rights to tests we otherwise would seek to develop or commercialize ourselves, or reserve certain opportunities for future potential arrangements when we might be able to achieve more favorable terms. If we are not able to secure additional funding when needed, we may have to delay, reduce the scope of or eliminate one or more research and development programs, selling and marketing initiatives, or potential acquisitions. In addition, we may have to work with a partner on one or more aspects of our tests or market development programs, which could lower the economic value of those tests or programs to our company.

We have acquired and may continue to acquire businesses or assets, form joint ventures or make investments in other companies or technologies that could harm our operating results, dilute our stockholders' ownership, or cause us to incur debt or significant expense.

As part of our business strategy, we have pursued and expect to continue to pursue acquisitions of complementary businesses or assets, as well as technology licensing arrangements. We also may pursue strategic alliances that leverage our core technology and industry experience to expand our offerings or distribution, or make investments in other companies. Since 2017, we have acquired several companies, including companies in family health genetic information services, the patient data collection industry, the non-invasive prenatal screen offering industry, the genetic information industry and the use of artificial intelligence in such industry, the pharmacogenetic testing industry, the oncology industry and the infectious disease industry.

With respect to our acquired businesses and any acquisitions we may make in the future, we may not be able to integrate these acquisitions successfully into our existing business, and we could assume unknown or contingent liabilities. For example, if we are unable to integrate ArcherDX's technology, people and distributed products business model into our existing business, we will not realize the expected benefits of that acquisition. Any acquisitions by us also could result in significant write-offs or the incurrence of debt and contingent liabilities, any of which could harm our operating results. Furthermore, as we experienced in the past, the loss of customers, payers, partners, suppliers or key management following the completion of any acquisitions by us could harm our business. Changes in services, sources of revenue, and branding or rebranding initiatives may involve substantial costs and may not be favorably received by customers, resulting in an adverse impact on our financial results, financial condition and stock price. Integration of an acquired company or business also may require management's time and resources that otherwise would be available for ongoing development of our existing business. We may also need to divert cash from other uses to fund these integration activities and these new businesses. Ultimately, we may not realize the anticipated benefits of any acquisition, technology license, strategic alliance, joint venture or investment, or these benefits may take longer to realize than we expected.

In connection with certain of our completed acquisitions, we have agreed to pay cash and/or stock consideration that is contingent upon the achievement of specified objectives, such as development objectives, regulatory submissions, regulatory approvals and revenue related to certain products. As of the date of the applicable acquisition, we record a contingent liability representing the estimated fair value of the contingent consideration we expect to pay. On a quarterly basis, we reassess these obligations and, in the event our estimate of the fair value of the contingent consideration changes, we record increases or decreases in the fair value as an adjustment to operating expense, which could have a material impact on our results of operations. As of March 31, 2021, we accrued $731.8 million of contingent consideration, most of which related to potential milestone payments in the form of our common stock in connection with our acquisition of ArcherDX. In addition, our actual payments may differ materially from the amount of the contingent liability, which could have a material impact on our results of operations.

To finance any acquisitions or investments, we may raise additional funds, which could adversely affect our existing stockholders and our business. If the price of our common stock is low or volatile, we may not be able to acquire other companies for stock. In addition, our stockholders may experience substantial dilution as a result of additional securities we may issue for acquisitions. Open market sales of substantial amounts of our common stock issued to stockholders of companies we acquire could also depress our stock price. Additional funds may not be available on terms that are favorable to us, or at all.

If third-party payers, including managed care organizations, private health insurers and government health plans do not provide adequate reimbursement for our tests or we are unable to comply with their requirements for reimbursement, our commercial success could be negatively affected.

Our ability to increase the number of billable tests and our revenue will depend on our success achieving reimbursement for our tests from third-party payers. Reimbursement by a payer may depend on a number of factors, including a payer's determination that a test is appropriate, medically necessary, cost-effective and has received prior authorization. The commercial success of our distributed products, including STRATAFIDE, a pan-solid tumor in vitro diagnostic, or IVD, and our Personalized Cancer Monitoring product, or PCM, if approved, will depend on the extent to which our customers receive coverage and adequate reimbursement from third-party payers, including managed care organizations and government payers (e.g., Medicare and Medicaid).

Since each payer makes its own decision as to whether to establish a policy or enter into a contract to cover our tests, as well as the amount it will reimburse for a test, seeking these approvals is a time-consuming and costly process. In addition, the determination by a payer to cover and the amount it will reimburse for our tests will likely be made on an indication-by-indication basis. To date, we have obtained policy-level reimbursement approval or contractual reimbursement for some indications for our tests from most of the large commercial third-party payers in the United States, and the Centers for Medicare & Medicaid Services, or CMS, provides reimbursement for our multi-gene tests for hereditary breast and ovarian cancer-related disorders as well as colon cancer. We believe that establishing adequate reimbursement from Medicare is an important factor in gaining adoption from healthcare providers. Our claims for reimbursement from third-party payers may be denied upon submission, and we must appeal the claims. The appeals process is time consuming and expensive and may not result in payment. In cases where there is not a contracted rate for reimbursement, there is typically a greater coinsurance or copayment requirement from the patient, which may result in further delay or decreased likelihood of collection.

In cases where we have established reimbursement rates with third-party payers, we face additional challenges in complying with their procedural requirements for reimbursement. These requirements often vary from payer to payer, and we have needed additional time and resources to comply with them. We have also experienced, and may continue to experience, delays in or denials of coverage if we do not adequately comply with these requirements. Our third-party payers have also requested, and in the future may request, audits of the amounts paid to us. We have been required to repay certain amounts to payers as a result of such audits, and we could be adversely affected if we are required to repay other payers for alleged overpayments due to lack of compliance with their reimbursement policies. In addition, we have experienced, and may continue to experience, delays in reimbursement when we transition to being an in-network provider with a payer.

We expect to continue to focus our resources on increasing adoption of, and expanding coverage and reimbursement for, our current tests and any future tests we may develop or acquire. If we fail to expand and maintain broad adoption of, and coverage and reimbursement for, our tests, our ability to generate revenue could be harmed and our future prospects and our business could suffer.

We face intense competition, which is likely to intensify further as existing competitors devote additional resources to, and new participants enter, the market. If we cannot compete successfully, we may be unable to increase our revenue or achieve and sustain profitability.

With the development of next generation sequencing, the clinical genetics market is becoming increasingly competitive, and we expect this competition to intensify in the future. We face competition from a variety of sources, including:

- dozens of relatively specialized competitors focused on genetics applied to healthcare, such as Ambry Genetics, a subsidiary of Konica Minolta Inc.; Athena Diagnostics and Blueprint Genetics, subsidiaries of Quest Diagnostics Incorporated; Baylor-Miraca Genetics Laboratories; Caris Life Sciences, Inc.; Centogene AG; Connective Tissue Gene Test LLC, a subsidiary of Health Network Laboratories, L.P.; Cooper Surgical, Inc.; Emory Genetics Laboratory, a subsidiary of Eurofins Scientific; Foundation Medicine, a subsidiary of Roche Holding AG; Fulgent Genetics, Inc., GeneDx, a subsidiary of OPKO Health, Inc.; Guardant Health, Inc.; Integrated Genetics, Sequenom Inc., Correlagen Diagnostics, Inc., and MNG Laboratories, subsidiaries of Laboratory Corporation of America Holdings; Myriad Genetics, Inc.; Natera, Inc.; Perkin Elmer, Inc.; PreventionGenetics, LLC; Progenity, Inc.; and Sema4 Genomics;
- a few large, established general testing companies with large market share and significant channel power, such as Laboratory Corporation of America Holdings and Quest Diagnostics Incorporated;
- a large number of clinical laboratories in an academic or healthcare provider setting that perform clinical genetic testing on behalf of their affiliated institutions and often sell and market more broadly; and
- a large number of new entrants into the market for genetic information ranging from informatics and analysis pipeline developers to focused, integrated providers of genetic tools and services for health and wellness including Illumina, Inc., which is also one of our suppliers.

Hospitals, academic medical centers and eventually physician practice groups and individual clinicians may also seek to perform at their own facilities the type of genetic testing we would otherwise perform for them. In this regard, continued development of equipment, reagents, and other materials as well as databases and interpretation services may enable broader direct participation in genetic testing and analysis.

Participants in closely related markets such as clinical trial or companion diagnostic testing could converge on offerings that are competitive with the type of tests we perform. Instances where potential competitors are aligned with key suppliers or are themselves suppliers could provide such potential competitors with significant advantages.

In addition, the biotechnology and genetic testing fields are intensely competitive both in terms of service and price, and continue to undergo significant consolidation, permitting larger clinical laboratory service providers to increase cost efficiencies and service levels, resulting in more intense competition.

We also face competition as a result of our 2020 acquisition of ArcherDX. In particular, ArcherDX competes with numerous companies in the life sciences research, clinical diagnostics and drug development spaces, including, among others, Natera, QIAGEN N.V., Guardant Health, Inc., Thermo Fisher, Inc., Foundation Medicine, Caris Life Sciences, Inc., Tempus, Laboratory Corporation of America, Quest Diagnostics, Inc., NeoGenomics, Inc., BioReference Laboratories, Inc. and Illumina, Inc.

We believe the principal competitive factors in our market are:

- breadth and depth of content;
- quality;
- reliability;
- accessibility of results;
- turnaround time of testing results;
- price and quality of tests;
- coverage and reimbursement arrangements with third-party payers;
- convenience of testing;
- brand recognition of test provider;
- additional value-added services and informatics tools;

- client service; and
- quality of website content.

Many of our competitors and potential competitors have longer operating histories, larger customer bases, greater brand recognition and market penetration, higher margins on their tests, substantially greater financial, technological and research and development resources, selling and marketing capabilities, lobbying efforts, and more experience dealing with third-party payers. As a result, they may be able to respond more quickly to changes in customer requirements, devote greater resources to the development, promotion and sale of their tests than we do, sell their tests at prices designed to win significant levels of market share, or obtain reimbursement from more third-party payers and at higher prices than we do. We may not be able to compete effectively against these organizations. Increased competition and cost-saving initiatives on the part of governmental entities and other third-party payers are likely to result in pricing pressures, which could harm our sales, profitability or ability to gain market share. In addition, competitors may be acquired by, receive investments from or enter into other commercial relationships with larger, well-established and well-financed companies as use of next generation sequencing for clinical diagnosis and preventative care increases. Certain of our competitors may be able to secure key inputs from vendors on more favorable terms, devote greater resources to marketing and promotional campaigns, adopt more aggressive pricing policies and devote substantially more resources to website and systems development than we can. In addition, companies or governments that control access to genetic testing through umbrella contracts or regional preferences could promote our competitors or prevent us from performing certain services. In addition, some of our competitors have obtained approval or clearance for certain of their tests from the U.S. Food and Drug Administration, or FDA. If payers decide to reimburse only for tests that are FDA-approved or FDA-cleared, or if they are more likely to reimburse for such tests, we may not be able to compete effectively unless we obtain similar approval or clearance for our tests. If we are unable to compete successfully against current and future competitors, we may be unable to increase market acceptance and sales of our tests, which could prevent us from increasing our revenue or achieving profitability and could cause our stock price to decline.

We may not be able to manage our future growth effectively, which could make it difficult to execute our business strategy.

Our expected future growth could create a strain on our organizational, administrative and operational infrastructure, including laboratory operations, quality control, technology services, customer service, marketing and sales, and management. We may not be able to maintain the quality of or expected turnaround times for our tests, or satisfy customer demand as it grows. We may need to continue expanding our sales force to facilitate our growth, and we may have difficulties locating, recruiting, training and retaining sales personnel. Our ability to manage our growth effectively will require us to continue to improve our operational, financial and management controls, as well as our reporting systems and procedures. As we grow, any failure of our controls or interruption of our production facilities or systems could have a negative impact on our business and financial operations. We plan to implement new enterprise software systems in a number of areas affecting a broad range of business processes and functional areas. The time and resources required to implement these new systems is uncertain, and failure to complete these activities in a timely and efficient manner could adversely affect our operations. Future growth in our business could also make it difficult for us to maintain our corporate culture. If we are unable to manage our growth effectively, it may be difficult for us to execute our business strategy and our business could be harmed.

Security breaches, privacy issues, loss of data and other incidents could compromise sensitive or personal information related to our business or prevent us from accessing critical information and expose us to liability, which could adversely affect our business and our reputation.

In the ordinary course of our business, we collect and store sensitive data, including protected health information, or PHI, personally identifiable information, genetic information, credit card information, intellectual property and proprietary business information owned or controlled by ourselves or our customers, payers and other parties. We manage and maintain our applications and data utilizing a combination of on-site systems, managed data center systems and cloud-based systems. We also communicate PHI and other sensitive patient data through our various customer tools and platforms. In addition to storing and transmitting sensitive data that is subject to multiple legal protections, these applications and data encompass a wide variety of business-critical information including research and development information, commercial information, and business and financial information. We face a number of risks relative to protecting this critical information, including loss of access risk, inappropriate disclosure, inappropriate modification, and the risk of our being unable to adequately monitor and modify our controls over our critical information. Any technical problems that may arise in connection with our data and systems, including those that are hosted by third-party providers, could result in interruptions to our business and operations or exposure to security vulnerabilities. These types of problems may be caused by a variety of factors,

including infrastructure changes, intentional or accidental human actions or omissions, software errors, malware, viruses, security attacks, fraud, spikes in customer usage and denial of service issues. From time to time, large third-party web hosting providers have experienced outages or other problems that have resulted in their systems being offline and inaccessible. Such outages could materially impact our business and operations.

The secure processing, storage, maintenance and transmission of this critical information are vital to our operations and business strategy, and we devote significant resources to protecting such information. Although we take what we believe to be reasonable and appropriate measures, including a formal, dedicated enterprise security program, to protect sensitive information from various compromises (including unauthorized access, disclosure, or modification or lack of availability), our information technology and infrastructure may be vulnerable to attacks by hackers or viruses or breached due to employee error, malfeasance or other disruptions. For example, ArcherDX has been subject to phishing incidents, and we may experience additional incidents in the future. Any such breach or interruption could compromise our networks and the information stored therein could be accessed by unauthorized parties, altered, publicly disclosed, lost or stolen.

Further, our various customer tools and platforms are currently accessible through our online portal and/or through our mobile applications, and there is no guarantee we can protect our them from a security breach. Unauthorized access, loss or dissemination could also disrupt our operations (including our ability to conduct our analyses, provide test results, bill payers or patients, process claims and appeals, provide customer assistance, conduct research and development activities, collect, process and prepare company financial information, provide information about our tests and other patient and physician education and outreach efforts through our website, and manage the administrative aspects of our business) and damage our reputation, any of which could adversely affect our business.

In addition to data security risks, we also face privacy risks. Should we actually violate, or be perceived to have violated, any privacy promises we make to patients or consumers, we could be subject to a complaint from an affected individual or interested privacy regulator, such as the FTC, a state Attorney General, an EU Member State Data Protection Authority, or a data protection authority in another international jurisdiction. This risk is heightened given the sensitivity of the data we collect.

Any security compromise that causes an apparent privacy violation could also result in legal claims or proceedings; liability under federal, state, foreign, or multinational laws that regulate the privacy, security, or breach of personal information, such as but not limited to the HIPAA, HITECH, state data security and data breach notification laws, the European Union's General Data Protection Regulation, or GDPR, and the UK Data Protection Act of 2018; and related regulatory penalties. Penalties for failure to comply with a requirement of HIPAA or HITECH vary significantly, and, depending on the knowledge and culpability of the HIPAA-regulated entity, may include civil monetary penalties of up to $1.5 million per calendar year for each provision of HIPAA that is violated. A person who knowingly obtains or discloses individually identifiable health information in violation of HIPAA may face a criminal penalty of up to $50,000 and up to one-year imprisonment. The criminal penalties increase if the wrongful conduct involves false pretenses or the intent to sell, transfer or use identifiable health information for commercial advantage, personal gain or malicious harm. Penalties for unfair or deceptive acts or practices under the FTC Act or state Unfair and Deceptive Acts and Practices, or UDAP, statutes may also vary significantly.

There has been unprecedented activity in the development of data protection regulation around the world. As a result, the interpretation and application of consumer, health-related and data protection laws in the United States, Europe and elsewhere are often uncertain, contradictory and in flux. The GDPR took effect on May 25, 2018. The GDPR applies to any entity established in the EU as well as extraterritorially to any entity outside the EU that offers goods or services to, or monitors the behavior of, individuals who are located in the EU. The GDPR imposes strict requirements on controllers and processors of personal data, including enhanced protections for "special categories" of personal data, which includes sensitive information such as health and genetic information of data subjects. The GDPR also grants individuals various rights in relation to their personal data, including the rights of access, rectification, objection to certain processing and deletion. The GDPR provides an individual with an express right to seek legal remedies if the individual believes his or her rights have been violated. Failure to comply with the requirements of the GDPR or the related national data protection laws of the member states of the EU, which may deviate from or be more restrictive than the GDPR, may result in significant administrative fines issued by EU regulators. Maximum penalties for violations of the GDPR are capped at 20M euros or 4% of an organization's annual global revenue, whichever is greater.

Further, the United Kingdom's decision to leave the European Union, often referred to as Brexit, has created uncertainty with regard to data protection regulation in the United Kingdom. In particular, it is still unclear whether the transfer of personal information from the EU to the United Kingdom will in the future remain lawful under the GDPR. The United Kingdom-EU post-Brexit trade deal provides that transfers of personal information to the United

Kingdom will not be treated as restricted transfers to a non-EU country for a period of up to six months from January 1, 2021. However, unless the EU Commission makes an "adequacy finding" with respect to the United Kingdom before the end of that transition period, from that date the United Kingdom will be a "third country" under the GDPR and transfers of personal information from the EU to the United Kingdom will require an "adequacy mechanism," such as the standard contractual clauses.

Additionally, the implementation of GDPR has led other jurisdictions to either amend or propose legislation to amend their existing data privacy and cybersecurity laws to resemble the requirements of GDPR. For example, on June 28, 2018, California adopted the California Consumer Privacy Act of 2018, or the CCPA. The CCPA regulates how certain for-profit businesses that meet one or more CCPA applicability thresholds collect, use, and disclose the personal information of consumers who reside in California. Among other things, the CCPA confers to California consumers the right to receive notice of the categories of personal information that will be collected by a business, how the business will use and share the personal information, and the third parties who will receive the personal information; the CCPA also confers rights to access, delete, or transfer personal information; and the right to receive equal service and pricing from a business after exercising a consumer right granted by the CCPA. In addition, the CCPA allows California consumers the right to opt out of the "sale" of their personal information, which the CCPA defines broadly as any disclosure of personal information to a third party in exchange for monetary or other valuable consideration. The CCPA also requires a business to implement reasonable security procedures to safeguard personal information against unauthorized access, use, or disclosure. California amended the law in September 2018 to exempt all PHI collected by certain parties subject to HIPAA, and further amended the law in September 2020 to clarify that de-identified data as defined under HIPAA will also be exempt from the CCPA. The California Attorney General's final regulations implementing the CCPA took effect on August 14, 2020. The CCPA provides for civil penalties for violations, as well as a private right of action for data breaches resulting from a business's failure to implement and maintain reasonable data security procedures that is expected to increase data breach litigation.

In addition, California voters recently approved the California Privacy Rights Act of 2020, or CPRA, that is scheduled to go into effect on January 1, 2023. The CPRA would, among other things, amend the CCPA to give California residents the ability to limit the use of their sensitive information, provide for penalties for CPRA violations concerning California residents under the age of 16, and establish a new California Privacy Protection Agency to implement and enforce the law. Other jurisdictions in the United States are beginning to propose laws similar to the CCPA. Some observers have noted that the CCPA could mark the beginning of a trend toward more stringent privacy legislation in the United States, which could increase our potential liability and adversely affect our business, results of operations, and financial condition.

It is possible the GDPR, CCPA and other emerging United States and international data protection laws may be interpreted and applied in a manner that is inconsistent with our practices. If so, this could result in government-imposed fines or orders requiring that we change our practices, which could adversely affect our business. In addition, these privacy laws and regulations may differ from country to country and state to state, and our obligations under these laws and regulations vary based on the nature of our activities in the particular jurisdiction, such as whether we collect samples from individuals in the local jurisdiction, perform testing in the local jurisdiction, or process personal information regarding employees or other individuals in the local jurisdiction. Complying with these various laws and regulations could cause us to incur substantial costs or require us to change our business practices and compliance procedures in a manner adverse to our business. We can provide no assurance that we are or will remain in compliance with diverse privacy and data security requirements in all of the jurisdictions in which we do business. Failure to comply with privacy and data security requirements could result in a variety of consequences, including civil or criminal penalties, litigation, or damage to our reputation, any of which could have a material adverse effect on our business.

We rely on highly skilled personnel in a broad array of disciplines and, if we are unable to hire, retain or motivate these individuals, or maintain our corporate culture, we may not be able to maintain the quality of our services or grow effectively.

Our performance, including our research and development programs and laboratory operations, largely depend on our continuing ability to identify, hire, develop, motivate and retain highly skilled personnel for all areas of our organization, including software developers, geneticists, biostatisticians, certified laboratory scientists and other scientific and technical personnel to process and interpret our genetic tests. In addition, we may need to continue to expand our sales force with qualified and experienced personnel. Competition in our industry for qualified employees is intense, and we may not be able to attract or retain qualified personnel in the future due to the competition for qualified personnel among life science and technology businesses as well as universities and public and private research institutions, particularly in the San Francisco Bay Area. In addition, our compensation arrangements, such as our equity award programs, may not always be successful in attracting new employees and

retaining and motivating our existing employees. If we are not able to attract and retain the necessary personnel to accomplish our business objectives, we may experience constraints that could adversely affect our ability to scale our business, and support our research and development efforts and our clinical laboratory. We believe that our corporate culture fosters innovation, creativity and teamwork. However, as our organization grows, we may find it increasingly difficult to maintain the beneficial aspects of our corporate culture. This could negatively impact our ability to retain and attract employees and our future success.

We need to scale our infrastructure in advance of demand for our tests, and our failure to generate sufficient demand for our tests would have a negative impact on our business and our ability to attain profitability.

Our success depends in large part on our ability to extend our market position, to provide customers with high-quality test reports quickly and at a lower price than our competitors, and to achieve sufficient test volume to realize economies of scale. In order to execute our business model, we intend to continue to invest heavily in order to significantly scale our infrastructure, including our testing capacity and information systems, expand our commercial operations, customer service, billing and systems processes and enhance our internal quality assurance program. We expect that much of this growth will be in advance of demand for our tests. Our current and future expense levels are to a large extent fixed and are largely based on our investment plans and our estimates of future revenue. Because the timing and amount of revenue from our tests is difficult to forecast, when revenue does not meet our expectations, we may not be able to adjust our spending promptly or reduce our spending to levels commensurate with our revenue. Even if we are able to successfully scale our infrastructure and operations, we cannot assure you that demand for our tests will increase at levels consistent with the growth of our infrastructure. If we fail to generate demand commensurate with this growth or if we fail to scale our infrastructure sufficiently in advance of demand to successfully meet such demand, our business, prospects, financial condition and results of operations could be adversely affected.

If we are not able to continue to generate substantial demand of our tests, our commercial success will be negatively affected.

Our business model assumes that we will be able to generate significant test volume, and we may not succeed in continuing to drive adoption of our tests to achieve sufficient volumes. Inasmuch as detailed genetic data from broad-based testing panels such as our tests have only recently become available at relatively affordable prices, the continued pace and degree of clinical acceptance of the utility of such testing is uncertain. Specifically, it is uncertain how much genetic data will be accepted as necessary or useful, as well as how detailed that data should be, particularly since medical practitioners may have become accustomed to genetic testing that is specific to one or a few genes. Given the substantial amount of additional information available from a broad-based testing panel such as ours, there may be distrust as to the reliability of such information when compared with more limited and focused genetic tests. To generate further demand for our tests, we will need to continue to make clinicians aware of the benefits of our tests, including the price, the breadth of our testing options, and the benefits of having additional genetic data available from which to make treatment decisions. A lack of or delay in clinical acceptance of broad-based panels such as our tests would negatively impact sales and market acceptance of our tests and limit our revenue growth and potential profitability. Genetic testing is expensive and many potential customers may be sensitive to pricing. In addition, potential customers may not adopt our tests if adequate reimbursement is not available, or if we are not able to maintain low prices relative to our competitors. Also, we may not be successful in increasing demand for our tests through our direct channel, in which we facilitate the ordering of our genetic tests by consumers through an online network of physicians.

If we are not able to generate demand for our tests at sufficient volume, or if it takes significantly more time to generate this demand than we anticipate, our business, prospects, financial condition and results of operations could be materially harmed.

We have devoted a portion of our resources to the development and commercialization of STRATAFIDE, and to research and development activities related to our PCM product for cancer monitoring, including clinical and regulatory initiatives to obtain diagnostic clearance and marketing approval. The demand for these regulated products is unproven, and we may not be successful in achieving market awareness and demand for these products through our sales and marketing operations.

If our STRATAFIDE and PCM products and related services do not perform as expected, we may not realize the expected benefits of our recent acquisition of ArcherDX.

The success of our STRATAFIDE and PCM products depends on the market's confidence that we can provide reliable products that enable high quality diagnostic testing with high sensitivity and specificity and short turnaround times. There is no guarantee that the accuracy and reproducibility ArcherDX demonstrated in the research use only, or RUO, market will continue as we launch commercial IVD products and our product deliveries increase and product portfolio expands.

Our RUO products, STRATAFIDE and PCM products and related services use a number of complex and sophisticated biochemical and bioinformatics processes, many of which are highly sensitive to external factors. An operational, technological or other failure in one of these complex processes or fluctuations in external variables may result in sensitivity or specificity rates that are lower than we anticipate or result in longer than expected turnaround times. In addition, labs are required to validate their processes before using these products for clinical purposes. These validations are outside of our control. If our products do not perform, or are perceived to not have performed, as expected or favorably to competitive products, our consolidated operating results, reputation, and business will suffer, and we may also be subject to legal claims arising from product limitations, errors, or inaccuracies.

In addition, we plan to match our test reports for STRATAFIDE to identified mutations with FDA-approved targeted therapies or relevant clinical trials of targeted therapies. If a patient or physician who orders a test using one of our products is unable to obtain, or be reimbursed for the use of, targeted therapies because they are not indicated in the FDA-approved label for treatment, the patient is unable to enroll in an identified clinical trial due to the enrollment criteria of the trial, or some other reason, the ordering physician may conclude the test report does not contain actionable information. If physicians do not believe our products consistently generate actionable information about their patients' disease or condition, they may be less likely to use our products.

Furthermore, we cannot provide assurance that customers will always use these products in the manner in which intended. Any intentional or unintentional misuse of these products by customers could lead to substantial civil and criminal monetary and non-monetary penalties, and could result in significant legal and investigatory fees.

The future growth of our distributed products business is partially dependent upon regulatory approval and market acceptance of our IVD products, including STRATAFIDE and PCM.

We anticipate that the future success of our distributed products business will depend in large part on our ability to effectively introduce enhanced or new offerings of IVD products, such as STRATAFIDE. The development and launch of enhanced or new products and services, whether RUO or IVD, require the completion of certain clinical development and commercialization activities that are complex, costly, time-intensive and uncertain, and require us to accurately anticipate patients', providers' and, if applicable, payers' attitudes and needs and emerging technology and industry trends. This process is conducted in various stages, and each stage presents the risk that we will not achieve its goals on a timely basis, or at all.

We have limited experience commercializing IVD products. We may experience research and development, regulatory, marketing and other difficulties that could delay or prevent our introduction of enhanced or new products or new services and result in increased costs and the diversion of management's attention and resources from other business matters.

An important factor in our ability to commercialize our distributed products is collecting data that supports their value proposition. The data collected from any studies we complete may not be favorable or consistent with its existing data or may not be statistically significant or compelling to the medical community or to third-party payers seeking such data for purposes of determining coverage for these products. This is particularly true with respect to service defects and errors. Any of the foregoing could have a negative impact on our ability to commercialize our future products, which could have a material adverse effect on our ability to realize the intended benefits of our acquisition of ArcherDX.

Our success will depend on our ability to use rapidly changing genetic data to interpret test results accurately and consistently, and our failure to do so would have an adverse effect on our operating results and business, harm our reputation and could result in substantial liabilities that exceed our resources.

Our success depends on our ability to provide reliable, high-quality tests that incorporate rapidly evolving information about the role of genes and gene variants in disease and clinically relevant outcomes associated with those variants. Errors, such as failure to detect genomic variants with high accuracy, or mistakes, such as failure to identify, or incompletely or incorrectly identifying, gene variants or their significance, could have a significant adverse impact on our business.

Hundreds of genes can be implicated in some disorders, and overlapping networks of genes and symptoms can be implicated in multiple conditions. As a result, a substantial amount of judgment is required in order to interpret testing results for an individual patient and to develop an appropriate patient report. We classify variants in accordance with published guidelines as benign, likely benign, variants of uncertain significance, likely pathogenic or pathogenic, and these guidelines are subject to change. In addition, it is our practice to offer support to clinicians and geneticists ordering our tests regarding which genes or panels to order as well as interpretation of genetic variants. We also rely on clinicians to interpret what we report and to incorporate specific information about an individual patient into the physician's treatment decision.

The marketing, sale and use of our genetic tests could subject us to liability for errors in, misunderstandings of, or inappropriate reliance on, information we provide to clinicians, geneticists or patients, and lead to claims against us if someone were to allege that a test failed to perform as it was designed, if we failed to correctly interpret the test results, if we failed to update the test results due to a reclassification of the variants according to new published guidelines, or if the ordering physician were to misinterpret test results or improperly rely on them when making a clinical decision. In addition, our entry into the reproductive health and pharmacogenetic testing markets expose us to increased liability. A product liability or professional liability claim could result in substantial damages and be costly and time-consuming for us to defend. Although we maintain liability insurance, including for errors and omissions, we cannot assure you that such insurance would fully protect us from the financial impact of defending against these types of claims or any judgments, fines or settlement costs arising out of any such claims. Any liability claim, including an errors and omissions liability claim, brought against us, with or without merit, could increase our insurance rates or prevent us from securing insurance coverage in the future. Additionally, any liability lawsuit could cause injury to our reputation or cause us to suspend sales of our tests. The occurrence of any of these events could have an adverse effect on our reputation and results of operations.

Our industry is subject to rapidly changing technology and new and increasing amounts of scientific data related to genes and genetic variants and their role in disease. Our failure to develop tests to keep pace with these changes could make us obsolete.

In recent years, there have been numerous advances in methods used to analyze very large amounts of genomic information and the role of genetics and gene variants in disease and treatment therapies. Our industry has and will continue to be characterized by rapid technological change, increasingly larger amounts of data, frequent new testing service introductions and evolving industry standards, all of which could make our tests obsolete. Our future success will also depend on our ability to keep pace with the evolving needs of our customers on a timely and cost-effective basis and to pursue new market opportunities that develop as a result of technological and scientific advances. Our tests could become obsolete and our business adversely affected unless we continually update our offerings to reflect new scientific knowledge about genes and genetic variations and their role in diseases and treatment therapies.

Our success will depend in part on our ability to generate sales using our internal sales team and through alternative marketing strategies.

We may not be able to market or sell our current tests and any future tests we may develop or acquire effectively enough to drive demand sufficient to support our planned growth. We currently sell our tests primarily through our internal sales force. Historically, our sales efforts have been focused primarily on hereditary cancer and more recently on reproductive health. Our efforts to sell our tests to clinicians and patients outside of oncology may not be successful, or may be difficult to do successfully without significant additional selling and marketing efforts and expense. In addition, following the acquisition of ArcherDX, our sales efforts have expanded to include distributed products sold to laboratories. In the past, we have increased our sales force each year in order to drive our growth, and in October 2020, we increased our sales force through the acquisition of ArcherDX. In addition to the efforts of our sales force, future sales will depend in large part on our ability to develop and substantially expand awareness of our company and our tests through alternative strategies including through education of key opinion leaders, through social media-related and online outreach, education and marketing efforts, and through focused channel partner strategies designed to drive demand for our tests. We also plan to continue to spend on consumer advertising in connection with our direct channel to consumers, which could be costly. We have limited experience implementing these types of marketing efforts. We may not be able to drive sufficient levels of revenue using these sales and marketing methods and strategies necessary to support our planned growth, and our failure to do so could limit our revenue and potential profitability.

We also use a limited number of distributors to assist internationally with sales, logistics, education and customer support. Sales practices utilized by our distributors that are locally acceptable may not comply with sales practices standards required under U.S. laws that apply to us, which could create additional compliance risk. If our

sales and marketing efforts are not successful outside the United States, we may not achieve significant market acceptance for our tests outside the United States, which could adversely impact our business.

Impairment in the value of our goodwill or other intangible assets could have a material adverse effect on our operating results and financial condition.

We record goodwill and intangible assets at fair value upon the acquisition of a business. Goodwill represents the excess of amounts paid for acquiring businesses over the fair value of the net assets acquired. Goodwill and indefinite-lived intangible assets are evaluated for impairment annually, or more frequently if conditions warrant, by comparing the carrying value of a reporting unit to its estimated fair value. Intangible assets with definite lives are reviewed for impairment when events or circumstances indicate that their carrying value may not be recoverable. Declines in operating results, divestitures, sustained market declines and other factors that impact the fair value of our reporting unit could result in an impairment of goodwill or intangible assets and, in turn, a charge to net income. Any such charges could have a material adverse effect on our results of operations or financial condition.

We rely on a limited number of suppliers or, in some cases, sole suppliers, for some of our laboratory instruments, materials and services, and we may not be able to find replacements or immediately transition to alternative suppliers.

We rely on a limited number of suppliers, or, in some cases, sole suppliers, including Illumina, Inc., Integrated DNA Technologies Incorporated, Qiagen N.V., Roche Holdings Ltd. and Twist Bioscience Corporation for certain laboratory substances used in the chemical reactions incorporated into our processes, which we refer to as reagents, as well as sequencers and other equipment and materials which we use in our laboratory operations. We do not have short- or long-term agreements with most of our suppliers, and our suppliers could cease supplying these materials and equipment at any time, or fail to provide us with sufficient quantities of materials or materials that meet our specifications. Our laboratory operations could be interrupted if we encounter delays or difficulties in securing these reagents, sequencers or other equipment or materials, and if we cannot obtain an acceptable substitute. Any such interruption could significantly affect our business, financial condition, results of operations and reputation. We rely on Illumina as the sole supplier of next generation sequencers and associated reagents and as the sole provider of maintenance and repair services for these sequencers. Any disruption in Illumina's operations could impact our supply chain and laboratory operations as well as our ability to conduct our tests, and it could take a substantial amount of time to integrate replacement equipment into our laboratory operations.

We believe that there are only a few other manufacturers that are currently capable of supplying and servicing the equipment necessary for our laboratory operations, including sequencers and various associated reagents. The use of equipment or materials provided by these replacement suppliers would require us to alter our laboratory operations. Transitioning to a new supplier would be time consuming and expensive, may result in interruptions in our laboratory operations, could affect the performance specifications of our laboratory operations or could require that we revalidate our tests. We cannot assure you that we will be able to secure alternative equipment, reagents and other materials, and bring such equipment, reagents and materials on line and revalidate them without experiencing interruptions in our workflow. In the case of an alternative supplier for Illumina, we cannot assure you that replacement sequencers and associated reagents will be available or will meet our quality control and performance requirements for our laboratory operations. If we encounter delays or difficulties in securing, reconfiguring or revalidating the equipment and reagents we require for our tests, our business, financial condition, results of operations and reputation could be adversely affected.

Our planned STRATAFIDE and PCM products are currently being developed to use only Illumina's sequencing platform. Without access to these sequencers, we would be unable commercialize these products. In addition, any efforts to validate these distributed products on additional sequencing platforms would require significant resources, expenditures and time and attention of our management, and there is no guarantee that we would be successful in implementing any such sequencing platforms in a commercially sustainable way.

If our laboratories become inoperable due to disasters, health epidemics or for any other reasons, we will be unable to perform our tests and our business will be harmed.

We perform all of our tests at our production facilities in San Francisco and Irvine, California, in Golden, Colorado, and in Seattle, Washington. We plan to open a new laboratory and production facility in North Carolina. Our laboratories and the equipment we use to perform our tests would be costly to replace and could require substantial lead time to replace and qualify for use. Our laboratories may be harmed or rendered inoperable by natural or man-made disasters, including earthquakes, flooding, fire and power outages, or by health epidemics,

such as the COVID-19 pandemic, which may render it difficult or impossible for us to perform our tests for some period of time. This risk of natural disaster is especially high for us since we perform the substantial majority of our tests at our San Francisco laboratory, which is located in an active seismic region, and we do not have a redundant facility to perform the same tests in the event our San Francisco laboratory is inoperable. The inability to perform our tests or the backlog that could develop if our laboratories are inoperable for even a short period of time may result in the loss of customers or harm our reputation. Although we maintain insurance for damage to our property and the disruption of our business, this insurance may not cover all of our potential losses and may not continue to be available to us on acceptable terms, if at all. The inability to open the planned facility in North Carolina, delays in opening such facility or failure to obtain required permits could result in increased costs and prevent us from realizing the intended benefits of the new facility.

We rely on third-party laboratories to perform portions of our biopharmaceutical testing services.

A portion of our biopharmaceutical testing services is performed by third-party laboratories. These third-party laboratories are subject to contractual obligations to perform these services for us, but are not otherwise under our control. We therefore do not control the capacity and quality control efforts of these third-party laboratories other than through our ability to enforce contractual obligations on volume and quality systems, and have no control over such laboratories' compliance with applicable legal and regulatory requirements. We also have no control over the timeliness of such laboratories' performance of their obligations to us, and the third-party laboratories that we have contracted with have in the past had, and occasionally continue to have, issues with delivering results to us or resolving issues with us within the time frames we expected or established in our contracts with them, which sometimes results in longer than expected turnaround times for, or negatively impacts the performance of, these tests and services. In the event of any adverse developments with these third-party laboratories or their ability to perform their obligations in a timely manner and in accordance with the standards that we and our customers expect, our ability to service customers may be delayed, interrupted or otherwise adversely affected, which could result in a loss of customers and harm to our reputation. Furthermore, when these issues arise, we have had to expend time, management's attention and other resources to address and remedy such issues.

We may not have sufficient alternative backup if one or more of the third-party laboratories that we contract with are unable to satisfy their obligations to us with sufficient performance, quality and timeliness. Any natural or other disaster, acts of war or terrorism, shipping embargoes, labor unrest or political instability or similar events at one or more of these third-party laboratories' facilities that causes a loss of capacity would heighten the risks that we face. Changes to or termination of agreements or inability to renew agreements with these third-party laboratories or enter into new agreements with other laboratories that are able to perform such portions of our service offerings could impair, delay or suspend our efforts to market and sell these services.

The loss of any member or change in structure of our senior management team could adversely affect our business.

Our success depends in large part upon the skills, experience and performance of members of our executive management team and others in key leadership positions. The efforts of these persons will be critical to us as we continue to develop our technologies and test processes and focus on scaling our business. If we were to lose one or more key executives, we may experience difficulties in competing effectively, developing our technologies and implementing our business strategy. All of our executives and employees are at-will, which means that either we or the executive or employee may terminate their employment at any time. We do not carry key person insurance for any of our executives or employees. In addition, we do not have a long-term retention agreement in place with our president and chief executive officer.

Development of new tests is a complex process, and we may be unable to commercialize new tests on a timely basis, or at all.

We cannot assure you that we will be able to develop and commercialize new tests on a timely basis. Before we can commercialize any new tests, we will need to expend significant funds in order to:

- conduct research and development;
- further develop and scale our laboratory processes; and
- further develop and scale our infrastructure to be able to analyze increasingly larger and more diverse amounts of data.

Our testing service development process involves risk, and development efforts may fail for many reasons, including:

- failure of any test to perform as expected;
- lack of validation or reference data; or
- failure to demonstrate utility of a test.

As we develop tests, we will have to make significant investments in development, marketing and selling resources. In addition, competitors may develop and commercialize competing tests faster than we are able to do so.

Our research and development efforts to add additional indications to our IVD products, if approved, will be hindered if we are not able to contract with third parties for access to tissue samples.

Under standard clinical practice, tumor biopsies removed from patients are preserved and stored in formalin-fixed paraffin embedded, or FFPE, format, and liquid biopsies are taken with a blood draw and stored in blood collection tubes. In order to add additional indications to our IVD products, if approved, we will need to secure access to these FFPE tumor biopsy and liquid biopsy samples, as well as information pertaining to the clinical outcomes of the patients from which they were derived for IVD development activities. Others compete with us for access to these samples. Additionally, the process of negotiating access to samples is lengthy because it typically involves numerous parties and approval levels to resolve complex issues such as usage rights, institutional review board approval, privacy rights, publication rights, intellectual property ownership and research parameters. If we are unable to negotiate access to tissue samples on a timely basis or on commercially reasonable terms, or at all, or if other laboratories or competitors secure access to these samples before us, our ability to research, develop and commercialize future IVD products will be limited or delayed.

We depend on our information technology systems, and any failure of these systems could harm our business.

We depend on information technology and telecommunications systems for significant elements of our operations, including our laboratory information management system, our bioinformatics analytical software systems, our database of information relating to genetic variations and their role in disease process and drug metabolism, our clinical report optimization systems, our customer-facing web-based software, our customer reporting, and our various customer tools and platforms. We have installed, and expect to expand, a number of enterprise software systems that affect a broad range of business processes and functional areas, including for example, systems handling human resources, financial controls and reporting, customer relationship management, regulatory compliance and other infrastructure operations. In addition, we intend to extend the capabilities of both our preventative and detective security controls by augmenting the monitoring and alerting functions, the network design, and the automatic countermeasure operations of our technical systems. These information technology and telecommunications systems support a variety of functions, including laboratory operations, test validation, sample tracking, quality control, customer service support, billing and reimbursement, research and development activities, scientific and medical curation, and general administrative activities, including financial reporting.

Information technology and telecommunications systems are vulnerable to damage from a variety of sources, including telecommunications or network failures, malicious human acts and natural disasters. Moreover, despite network security and back-up measures, some of our servers are potentially vulnerable to physical or electronic break-ins, computer viruses and similar disruptive problems. Despite the precautionary measures we have taken to prevent unanticipated problems that could affect our information technology and telecommunications systems, failures or significant downtime of our information technology or telecommunications systems or those used by our third-party service providers could prevent us from conducting tests, preparing and providing reports to clinicians, billing payers, processing reimbursement appeals, handling physician or patient inquiries, conducting research and development activities, and managing the administrative and financial aspects of our business. Any disruption or loss of information technology or telecommunications systems on which critical aspects of our operations depend could have an adverse effect on our business and results of operations.

Technical problems have arisen, and may arise in the future, in connection with our data and systems, including those that are hosted by third-party providers, which have in the past and may in the future result in interruptions in our business and operations. These types of problems may be caused by a variety of factors, including infrastructure changes, human or software errors, viruses, security attacks, fraud, spikes in customer usage and denial of service issues. From time to time, large third-party web hosting providers have experienced outages or other problems that have resulted in their systems being offline and inaccessible. Such outages could materially impact our business and operations.

Ethical, legal and social concerns related to the use of genetic information could reduce demand for our tests.

Genetic testing has raised ethical, legal and social issues regarding privacy rights and the appropriate uses of the resulting information. Governmental authorities could, for social or other purposes, limit or regulate the use of genetic information or genetic testing or prohibit testing for genetic predisposition to certain conditions, particularly for those that have no known cure. Similarly, these concerns may lead patients to refuse to use, or clinicians to be reluctant to order, genomic tests even if permissible. These and other ethical, legal and social concerns may limit market acceptance of our tests or reduce the potential markets for our tests, either of which could have an adverse effect on our business, financial condition or results of operations.

Our international business exposes us to business, regulatory, political, operational, financial and economic risks associated with doing business outside of the United States.

Doing business internationally involves a number of risks, including:

- multiple, conflicting and changing laws and regulations such as privacy regulations, tax laws, export and import restrictions, employment laws, regulatory requirements, and other governmental approvals, permits and licenses;
- failure by us or our distributors to obtain regulatory approvals for the use of our tests in various countries;
- complexities and difficulties in obtaining protection and enforcing our intellectual property;
- difficulties in staffing and managing foreign operations;
- complexities associated with managing multiple payer reimbursement regimes, government payers or patient self-pay systems;
- logistics and regulations associated with shipping samples, including infrastructure conditions, customs and transportation delays;
- limits on our ability to penetrate international markets if we do not to conduct our tests locally;
- natural disasters, including the recent and ongoing outbreak and spreading of COVID-19, political and economic instability, including wars, terrorism and political unrest, outbreak of disease, boycotts, curtailment of trade and other business restrictions; and
- regulatory and compliance risks that relate to maintaining accurate information and control over activities that may fall within the purview of the U.S. Foreign Corrupt Practices Act, or FCPA, its books and records provisions, or its anti-bribery provisions.

Any of these factors could significantly harm our international operations and, consequently, our revenue and results of operations.

In addition, applicable export or import laws and regulations such as prohibitions on the export of samples imposed by countries outside of the United States, or international privacy or data restrictions that are different or more stringent than those of the United States, may require that we build additional laboratories or engage in joint ventures or other business partnerships in order to offer our tests internationally in the future. Any such restrictions would impair our ability to offer our tests in such countries and could have an adverse effect on our business, financial condition and results of operations.

Our ability to use our net operating loss carryforwards and certain other tax attributes may be limited.

At March 31, 2021, our total gross deferred tax assets were $418.9 million. Due to our lack of earnings history and uncertainties surrounding our ability to generate future taxable income, our net deferred tax assets have been fully offset by a valuation allowance. The deferred tax assets are primarily comprised of federal and state tax net operating losses and tax credit carryforwards. Furthermore, under Section 382 of the Internal Revenue Code of 1986, as amended, or the Internal Revenue Code, if a corporation undergoes an "ownership change," the corporation's ability to use its pre-change net operating loss carryforwards, or NOLs, and other pre-change tax attributes (such as research tax credits) to offset its future taxable income may be limited. In general, an "ownership change" occurs if there is a cumulative change in our ownership by "5% shareholders" that exceeds 50 percentage points over a rolling three-year period. Some of our prior acquisitions have resulted in an ownership change, and we may experience ownership changes in the future. Our existing NOLs and tax credit carryovers may be subject to limitations arising from previous ownership changes, and if we undergo one or more ownership changes in connection with completed acquisitions, or other future transactions in our stock, our ability to utilize NOLs and tax credit carryovers could be further limited by Section 382 of the Internal Revenue Code. As a result, if we earn net taxable income, our ability to use our pre-change net operating loss and tax credit carryforwards to offset U.S. federal taxable income may be subject to limitations, which could potentially result in increased future tax liability to us. The annual limitation may result in the expiration of certain net operating loss and tax credit carryforwards before their utilization. In addition, the Tax Cuts and Jobs Act limits the deduction for NOLs to 80% of current year taxable income and eliminates NOL carrybacks. Also, at the state level, there may be periods during which the use of NOLs is suspended or otherwise limited, which could accelerate or permanently increase state taxes owed.

Risks related to government regulation

If the FDA regulates the tests we currently offer as LDTs as medical devices, we could incur substantial costs and our business, financial condition and results of operations could be adversely affected.

We provide many of our tests as laboratory-developed tests, or LDTs. CMS and certain state agencies regulate the performance of LDTs (as authorized by CLIA, and state law, respectively).

Historically, the FDA has exercised enforcement discretion with respect to most LDTs and has not required laboratories that furnish LDTs to comply with the agency's requirements for medical devices (e.g., establishment registration, device listing, quality systems regulations, premarket clearance or premarket approval, and post-market controls). However, the FDA has stated it intends to end its policy of general enforcement discretion and regulate certain LDTs as medical devices. To this end, on October 3, 2014, the FDA issued two draft guidance documents, entitled "Framework for Regulatory Oversight of Laboratory Developed Tests (LDTs)" and "FDA Notification and Medical Device Reporting for Laboratory Developed Tests (LDTs)," respectively, that set forth a proposed risk-based regulatory framework that would apply varying levels of FDA oversight to LDTs. Subsequently, on January 13, 2017, the FDA published a "discussion paper" in which it outlined a substantially revised "possible approach" to the oversight of LDTs.

In March 2020, a bill titled the "Verifying Accurate Leading-edge IVCT Development Act of 2020," or VALID Act, was officially introduced in Congress. The bill proposes a risk-based approach to regulate LDTs and creates a new in vitro clinical test, or IVCT, category of regulated products, which includes LDTs, and a regulatory structure under the FDA. As proposed, the bill grandfathers many existing tests from the proposed premarket approval, quality systems, and labeling requirements, respectively, but would require such tests to comply with other regulatory requirements (e.g., registration and listing, adverse event reporting). Later that month, Senator Paul introduced the Verified Innovative Testing in American Laboratories Act of 2020, or VITAL Act, which proposes that all aspects of "laboratory-developed testing procedures" be subject to regulation under CLIA, and that no aspects of such procedures be subject to regulation by the FDA. We cannot predict if either of these bills will be enacted in their current (or any other) form and cannot quantify the effect of these bills on our business.

In August 2020, the U.S. Department of Health and Human Services, the parent agency for FDA, announced that the FDA "will not require premarket review of LDTs absent notice-and-comment rulemaking, as opposed to through guidance documents, compliance manuals, website statements, or other informal issuances." It is unclear at this time whether this policy will be retained by the Biden Administration, and if so, when the FDA might seek to begin the notice and comment rulemaking process.

Legislative proposals addressing the FDA's oversight of LDTs have been introduced in previous Congresses, and we expect that new legislative proposals may be introduced from time-to-time. The likelihood that Congress will pass such legislation and the extent to which such legislation may affect the FDA's plans to regulate certain LDTs as medical devices is difficult to predict at this time.

In April 2020, we completed our acquisition of Genelex Solutions, LLC, which offers certain pharmacogenetic, or PGx, tests as LDTs. Recently the FDA has taken a more active role in the oversight of PGx tests offered as LDTs. In 2019, the FDA contacted several clinical laboratories, including Genelex, to demand changes to PGx test reports and marketing materials. In February 2020, the FDA issued a statement indicating that it continues to have concerns about the claims that certain clinical laboratories make with respect to their PGx tests, and published tables that list PGx associations for which FDA has determined that the data support therapeutic management recommendations, a potential impact on safety or response, or a potential impact on pharmacokinetic properties only, respectively. To date, however, the FDA has not provided any general guidance on the type(s) of claims or other characteristics that will cause a PGx test to fall outside FDA's enforcement discretion. As such, the extent to which the FDA will allow any laboratory, including Genelex or Invitae, to offer PGx tests in their current form without meeting FDA regulatory requirements for medical devices is unclear at this time.

If the FDA ultimately regulates certain LDTs (either as medical devices or as part of a new stand-alone regulatory category for IVCTs), whether via individualized enforcement action, or more generally, as outlined in final guidance or final regulation, or as instructed by Congress, our tests may be subject to certain additional regulatory requirements. Complying with the FDA's requirements can be expensive, time-consuming and subject us to significant or unanticipated delays. Insofar as we may be required to obtain premarket clearance or approval to perform or continue performing an LDT, we cannot assure you that we will be able to obtain such authorization. Even if we obtain regulatory clearance or approval where required, such authorization may not be for the intended uses that we believe are commercially attractive or are critical to the commercial success of our tests. As a result, the application of the FDA's requirements to our tests could materially and adversely affect our business, financial condition and results of operations.

Failure to comply with applicable FDA regulatory requirements may trigger a range of enforcement actions by the FDA including warning letters, civil monetary penalties, injunctions, criminal prosecution, recall or seizure, operating restrictions, partial suspension or total shutdown of operations, and denial of or challenges to applications for clearance or approval, as well as significant adverse publicity.

In addition, in November 2013, the FDA issued final guidance regarding the distribution of products labeled for research use only. Certain of the reagents and other products we use in our tests are labeled as research use only products. Certain of our suppliers may cease selling research use only products to us and any failure to obtain an acceptable substitute could significantly and adversely affect our business, financial condition and results of operations.

If we fail to comply with federal, state and foreign laboratory licensing requirements, we could lose the ability to perform our tests or experience disruptions to our business.

We are subject to CLIA, a federal law that regulates clinical laboratories that perform testing on specimens derived from humans for the purpose of providing information for the diagnosis, prevention or treatment of disease. CLIA regulations establish specific standards with respect to personnel qualifications, facility administration, proficiency testing, quality control, quality assurance and inspections. CLIA certification is also required in order for us to be eligible to bill state and federal healthcare programs, as well as many private third-party payers, for our tests. We have current CLIA certifications to conduct our tests at our laboratories in San Francisco and Irvine, California, Golden, Colorado, and Seattle, Washington. To renew these certifications, we are subject to survey and inspection every two years. Moreover, CLIA inspectors may make random inspections of our clinical reference laboratories.

We are also required to maintain in-state licenses to conduct testing in California and Washington. California and Washington laws establish standards for day-to-day operation of our clinical reference laboratories in San Francisco and Irvine, and in Seattle, respectively, which include the training and skills required of personnel and quality control. (Our Colorado laboratory is not required to maintain a state clinical laboratory license.)

Several states require the licensure of out-of-state laboratories that accept specimens from those states. Our California laboratories hold the required out-of-state laboratory licenses for Maryland, New York, Pennsylvania, and Rhode Island. Our Washington laboratory holds the required out-of-state laboratory licenses in Maryland, New York, Pennsylvania, and Rhode Island (but not California). Our laboratory in Colorado holds the required out-of-state laboratory licenses for California, Maryland, Pennsylvania and Rhode Island (but not New York).

In addition to having laboratory licenses in New York, our clinical reference laboratories are approved on test-specific bases for the tests they run as LDTs by the New York State Department of Health, or NYDOH, for tests offered to patients in New York. Other states may adopt similar licensure requirements in the future, which may require us to modify, delay or stop our operations in such jurisdictions. We may also be subject to regulation in foreign jurisdictions as we seek to expand international utilization of our tests or such jurisdictions adopt new licensure requirements, which may require review of our tests in order to offer them or may have other limitations such as restrictions on the transport of samples necessary for us to perform our tests that may limit our ability to make our tests available outside of the United States. Complying with licensure requirements in new jurisdictions may be expensive, time-consuming, and subject us to significant and unanticipated delays.

In order to eventually market certain of our current or future products and services in any particular foreign jurisdiction, we must establish and comply with numerous and varying regulatory requirements on a jurisdiction-by-jurisdiction basis regarding quality, safety, performance and efficacy. In addition, clinical trials or clinical investigations conducted in one country may not be accepted by regulatory authorities in other countries, and regulatory clearance, authorization or approval in one country does not guarantee regulatory clearance, authorization or approval in any other country. For example, the performance characteristics of certain of our products and services may need to be validated separately in specific ethnic and genetic populations. Approval processes vary among countries and can involve additional product testing and validation and additional administrative review periods.

Seeking foreign regulatory clearance, authorization or approval could result in difficulties and costs for us and our collaborators and require additional preclinical studies, clinical trials or clinical investigations which could be costly and time-consuming. Regulatory requirements and ethical approval obligations can vary widely from country to country and could delay or prevent the introduction of certain of our products and services in those countries. The foreign regulatory clearance, authorization or approval process involves all of the risks and uncertainties associated with FDA clearance, authorization or approval. If we or our collaborators fail to comply with regulatory requirements in international markets or to obtain and maintain required regulatory clearances, authorizations or approvals in international markets, or if those approvals are delayed, our target market will be reduced and our ability to realize the full market potential of our products and services will be unrealized.

Failure to comply with applicable clinical laboratory licensure requirements may result in a range of enforcement actions, including license suspension, limitation, or revocation, directed plan of action, onsite monitoring, civil monetary penalties, criminal sanctions, cancellation of the laboratory's approval to receive Medicare and Medicaid payment for its services, exclusion from some healthcare systems' programs, as well as significant adverse publicity. Any sanction imposed under CLIA, its implementing regulations, or state or foreign laws or regulations governing clinical laboratory licensure, or our failure to renew our CLIA certifications, a state or foreign license, or accreditation, could have a material adverse effect on our business, financial condition and results of operations. Even if we were able to bring our laboratory back into compliance, we could incur significant expenses and potentially lose revenue in doing so.

The College of American Pathologists, or CAP, maintains a clinical laboratory accreditation program. CAP asserts that its program is "designed to go well beyond regulatory compliance" and helps laboratories achieve the highest standards of excellence to positively impact patient care. While not required to operate a CLIA-certified laboratory, many private insurers require CAP accreditation as a condition to contracting with clinical laboratories to cover their tests. In addition, some countries outside the United States require CAP accreditation as a condition to permitting clinical laboratories to test samples taken from their citizens. We have CAP accreditations for our laboratories. Failure to maintain CAP accreditation could have a material adverse effect on the sales of our tests and the results of our operations.

We may not be able to obtain regulatory clearance or approval of our IVD products, or even if approved, such products may not be approved for guideline inclusion, which could adversely our ability to realize the intended benefits of our acquisition of ArcherDX.

A significant portion of our therapy selection and personalized cancer monitoring commercial strategy, including for STRATAFIDE and PCM, relies on receiving regulatory approvals with guideline inclusion to strengthen our position in establishing coverage and reimbursement of our IVD products with both public and private payers. If we do not receive such regulatory approvals in a timely manner or at all, or we are not successful in obtaining such guideline inclusion, we may not be able to commercialize our IVD products. Additionally, third-party payers may be unwilling to provide sufficient coverage and reimbursement for these products necessary for hospitals and other healthcare providers to adopt our solutions as part of their oncological treatment strategy. We have also focused our efforts on the development of PCM for FDA clearance and approval as a prognostic device for predicting recurrence of a primary cancer after initial treatment, which can include surgery alone or surgery plus adjuvant therapy.

Moreover, development of the data necessary to obtain regulatory clearance and/or approval of an IVD, such as STRATAFIDE, is time-consuming and carries with it the risk of not yielding the desired results. The performance achieved in published studies may not be repeated in later studies that may be required to obtain FDA clearance and/or approval or regulatory approvals in foreign jurisdictions. Limited results from earlier-stage verification studies may not predict results from studies in larger numbers of subjects drawn from more diverse populations over longer periods of time. Unfavorable results from ongoing preclinical and clinical studies could result in delays, modifications or abandonment of ongoing analytical or future clinical studies, or abandonment of a product development program, or may delay, limit or prevent regulatory approvals or clearances or commercialization of our product candidates, any of which may materially impact our ability to realize the expected benefits of our acquisition of ArcherDX.

Complying with numerous statutes and regulations pertaining to our business is an expensive and time-consuming process, and any failure to comply could result in substantial penalties.

Our operations are subject to other extensive federal, state, local and foreign laws and regulations, all of which are subject to change. These laws and regulations currently include, among others:

- HIPAA, which establishes comprehensive federal standards with respect to the privacy and security of protected health information and requirements for the use of certain standardized electronic transactions;
- amendments to HIPAA under HITECH, which strengthen and expand HIPAA privacy and security compliance requirements, increase penalties for violators and expand vicarious liability, extend enforcement authority to state attorneys general, and impose requirements for breach notification;
- the GDPR, which imposes strict privacy and security requirements on controllers and processors of personal data, including enhanced protections for “special categories” of personal data, including sensitive information such as health and genetic information of data subjects;
- the CCPA, which, among other things, regulates how subject businesses may collect, use, and disclose the personal information of consumers who reside in California, affords rights to consumers that they may exercise against businesses that collect their information, and requires implementation of reasonable security measures to safeguard personal information of California consumers;
- the federal Anti-Kickback Statute, which prohibits knowingly and willfully offering, paying, soliciting or receiving remuneration, directly or indirectly, overtly or covertly, in cash or in kind, to induce or in return for the referral of an individual, for the furnishing of or arrangement for the furnishing of any item or service for which payment may be made in whole or in part by a federal healthcare program, or the purchasing, leasing, ordering, arranging for, or recommend purchasing, leasing or ordering, any good, facility, item or service for which payment may be made, in whole or in part, under a federal healthcare program;
- EKRA, which prohibits payments for referrals to recovery homes, clinical treatment facilities, and laboratories and reaches beyond federal health care programs, to include private insurance;
- the federal physician self-referral law, known as the Stark Law, which prohibits a physician from making a referral to an entity for certain designated health services covered by the Medicare program, including laboratory and pathology services, if the physician or an immediate family member has a financial relationship with the entity unless an exception applies, and prohibits an entity from billing for designated health services furnished pursuant to a prohibited referral;

- the federal false claims law, which imposes liability on any person or entity that, among other things, knowingly presents, or causes to be presented, a false or fraudulent claim for payment to the federal government;
- the federal Civil Monetary Penalties Law, which prohibits, among other things, the offering or transfer of remuneration to a Medicare or state healthcare program beneficiary if the person knows or should know it is likely to influence the beneficiary's selection of a particular provider, practitioner or supplier of services reimbursable by Medicare or a state healthcare program, unless an exception applies;
- the HIPAA fraud and abuse provisions, which create new federal criminal statutes that prohibit, among other things, defrauding health care benefit programs, willfully obstructing a criminal investigation of a healthcare offense and falsifying or concealing a material fact or making any materially false statements in connection with the payment for healthcare benefits, items or services;
- other federal and state fraud and abuse laws, such as anti-kickback laws, prohibitions on self-referral, fee-splitting restrictions, insurance fraud laws, anti-markup laws, prohibitions on the provision of tests at no or discounted cost to induce physician or patient adoption, and false claims acts, which may extend to services reimbursable by any third-party payer, including private insurers;
- the 21st Century Cures Act information blocking prohibition, which prohibits covered actors from engaging in certain practices that are likely to interfere with the access, exchange, or use of electronic health information;
- the Physician Payments Sunshine Act and similar state laws that require reporting of certain payments and other transfers of value made by applicable manufacturers, directly or indirectly, to or on behalf of covered recipients including physicians (defined to include doctors, dentists, optometrists, podiatrists and chiropractors) and teaching hospitals as well as ownership and investment interests held by physicians and their immediate family members. Beginning in 2022, applicable manufacturers also will be required to report such information regarding its relationships with physician assistants, nurse practitioners, clinical nurse specialists, certified registered nurse anesthetists and certified nurse midwives during the previous year;
- state laws that limit or prohibit the provision of certain payments and other transfers of value to certain covered healthcare providers;
- the prohibition on reassignment of Medicare claims, which, subject to certain exceptions, precludes the reassignment of Medicare claims to any other party;
- state laws that prohibit other specified practices, such as billing clinicians for testing that they order; waiving coinsurance, copayments, deductibles and other amounts owed by patients; billing a state Medicaid program at a price that is higher than what is charged to one or more other payers; and
- similar foreign laws and regulations that apply to us in the countries in which we operate or may operate in the future.

We have adopted policies and procedures designed to comply with these laws and regulations. In the ordinary course of our business, we conduct internal reviews of our compliance with these laws. Our compliance may also be subject to governmental review. The growth of our business and our expansion outside of the United States may increase the potential of violating these laws or our internal policies and procedures. The risk of our being found in violation of these or other laws and regulations is further increased by the fact that many have not been fully interpreted by the regulatory authorities or the courts, and their provisions are open to a variety of interpretations. Any action brought against us for violation of these or other laws or regulations, even if we successfully defend against it, could cause us to incur significant legal expenses and divert our management's attention from the operation of our business. If our operations are found to be in violation of any of these laws and regulations, we may be subject to any applicable penalty associated with the violation, including significant administrative, civil and criminal penalties, damages, fines, imprisonment, exclusion from participation in Federal healthcare programs, refunding of payments received by us, and curtailment or cessation of our operations. Any of the foregoing consequences could seriously harm our business and our financial results.

Healthcare policy changes, including legislation reforming the U.S. healthcare system, may have a material adverse effect on our financial condition, results of operations and cash flows.

In March 2010, the Patient Protection and Affordable Care Act, as amended by the Health Care and Education Reconciliation Act, collectively referred to as the Affordable Care Act, was enacted in the United States, which made a number of substantial changes in the way healthcare is financed by both governmental and private insurers. Policy changes or implementation of new health care legislation could result in significant changes to health care systems. In the United States, this could include potential modification or repeal of all or parts of the Affordable Care Act.

In April 2014, Congress passed the Protecting Access to Medicare Act of 2014, or PAMA, which included substantial changes to the way in which clinical laboratory services are paid under Medicare. Under PAMA (as amended by the Further Consolidated Appropriations Act, 2020 and the Coronavirus Aid, Relief, and Economic Security Act, respectively) and its implementing regulations, clinical laboratories must report to CMS private payer rates beginning in 2017, and then in 2022 and every three years thereafter for clinical diagnostic laboratory tests that are not advanced diagnostic laboratory tests and every year for advanced diagnostic laboratory tests.

We do not believe that our tests meet the definition of advanced diagnostic laboratory tests, but in the event that we seek designation for one or more of our tests as an advanced diagnostic laboratory test and the tests are determined by CMS to meet these criteria or new criteria developed by CMS, we would be required to report private payer data for those tests annually. Otherwise, we will be required to report private payer rates for our tests on an every three years basis starting in 2022. Laboratories that fail to timely report the required payment information may be subject to substantial civil money penalties.

As set forth in the PAMA final rule, for tests furnished on or after January 1, 2018, Medicare payments for clinical diagnostic laboratory tests are paid based upon these reported private payer rates. For clinical diagnostic laboratory tests that are assigned a new or substantially revised code, initial payment rates for clinical diagnostic laboratory tests that are not advanced diagnostic laboratory tests will be assigned by the cross-walk or gap-fill methodology. Initial payment rates for new advanced diagnostic laboratory tests will be based on the actual list charge for the laboratory test. The payment rates calculated under PAMA went into effect starting January 1, 2018. Where applicable, reductions to payment rates resulting from the new methodology are limited to 10% per test per year in each of the years 2018 through 2020. Rates will be held at 2020 levels during 2021, and then, where applicable based upon median private payer rates reported in 2017 or 2022, reduced by up to 15% per test per year in each of 2022 through 2024 (with a second round of private payer rate reporting in 2022 to establish rates for 2023 through 2025).

PAMA also authorized the adoption of new, temporary billing codes and/or unique test identifiers for FDA-cleared or approved tests as well as advanced diagnostic laboratory tests. The CPT® Editorial Panel approved a proposal to create a new section of billing codes to facilitate implementation of this section of PAMA, but these codes would apply to our tests only if we apply for such codes.

In March 2018, CMS published a national coverage determination, or NCD, for next generation sequencing, or NGS tests for somatic (acquired) cancer testing. CMS subsequently updated this NCD in January 2020 to address coverage for NGS tests for germline (inherited) cancer testing and to clarify certain aspects of Medicare's coverage of NGS for somatic cancer testing. For somatic cancer testing, the updated NCD establishes full coverage for FDA-approved or FDA-cleared NGS-based companion diagnostic assays that report results using report templates that specify treatment options when offered for their FDA-approved or FDA-cleared use(s), ordered by the patient's treating physician for Medicare beneficiaries with advanced cancer (recurrent, relapsed, refractory, metastatic, or advanced stage III or IV cancer) who have not have previously been tested with the same test using NGS for the same cancer genetic content, and have decided to seek further cancer treatment (e.g., therapeutic chemotherapy). The NCD also gives MACs the authority to establish local coverage for NGS-based somatic cancer assays that are not FDA-approved or FDA-cleared companion diagnostics when offered to patients meeting the above-referenced criteria. It appears that NGS-based somatic cancer tests provided for patients with cancer that do not meet the above-referenced criteria, e.g., patients with earlier stage cancers, are currently nationally non-covered under the NCD.

Effective January 27, 2020, the NCD also established full coverage for FDA-approved or FDA-cleared NGS-based germline tests that report results using report templates that specify treatment options when ordered by the patient's treating physician for patients with ovarian or breast cancer, a clinical indication for germline testing for hereditary breast or ovarian cancer, and a risk factor for germline breast or ovarian cancer, provided the patient has not previously been tested with the same germline test using NGS for the same germline genetic content. The NCD also gives MACs the authority to establish local coverage for NGS-based germline tests for ovarian or breast cancer that are not FDA-approved or FDA-cleared, as well as for NGS-based tests for any other cancer diagnosis (regardless of the test's FDA regulatory status) when offered to patients meeting the above-referenced criteria for germline testing. Since we already have local coverage for our germline tests for ovarian and breast cancer, we believe that the NCD will not have a material impact on which of our tests will be reimbursable by CMS for Medicare patients.

We cannot predict whether future healthcare initiatives will be implemented at the federal or state level, or how any future legislation or regulation may affect us. For instance, the payment reductions imposed by the Affordable Care Act and the expansion of the federal and state governments' role in the U.S. healthcare industry as well as changes to the reimbursement amounts paid by payers for our tests and future tests or our medical procedure volumes may reduce our profits and have a materially adverse effect on our business, financial condition, results of operations and cash flows. Notably, Congress enacted legislation in 2017 that eliminated the Affordable Care Act's "individual mandate" beginning in 2019, which may significantly impact the number of covered lives participating in exchange plans. The U.S. Supreme Court is currently reviewing the constitutionality of the Affordable Care Act, although it is unclear when a decision will be made. Moreover, Congress has proposed on several occasions to impose a 20% coinsurance on patients for clinical laboratory tests reimbursed under the clinical laboratory fee schedule, which would increase our billing and collecting costs and decrease our revenue. Further, it is possible that additional governmental action be taken in response to the COVID-19 pandemic.

If we use hazardous materials in a manner that causes injury, we could be liable for resulting damages.

Our activities currently require the use of hazardous chemicals and biological material. We cannot eliminate the risk of accidental contamination or injury to employees or third parties from the use, storage, handling or disposal of these materials. In the event of contamination or injury, we could be held liable for any resulting damages, and any liability could exceed our resources or any applicable insurance coverage we may have. In 2018, we decommissioned our laboratory in Massachusetts; however, we could be held liable for any damages resulting from our prior use of hazardous chemicals and biological materials at this facility. Additionally, we are subject on an ongoing basis to federal, state and local laws and regulations governing the use, storage, handling and disposal of these materials and specified waste products. The cost of compliance with these laws and regulations may become significant, and our failure to comply may result in substantial fines or other consequences, and either could negatively affect our operating results.

We could be adversely affected by violations of the FCPA and other worldwide anti-bribery laws.

We are subject to the FCPA, which prohibits companies and their intermediaries from making payments in violation of law to non-U.S. government officials for the purpose of obtaining or retaining business or securing any other improper advantage. We are increasing our direct sales and operations personnel outside the United States, in which we have limited experience. We use a limited number of independent distributors to sell our tests internationally, which requires a high degree of vigilance in maintaining our policy against participation in corrupt activity, because these distributors could be deemed to be our agents, and we could be held responsible for their actions. Other U.S. companies in the medical device and pharmaceutical fields have faced criminal penalties under the FCPA for allowing their agents to deviate from appropriate practices in doing business with these individuals. We are also subject to similar anti-bribery laws in the jurisdictions in which we operate, including the United Kingdom's Bribery Act of 2010, which also prohibits commercial bribery and makes it a crime for companies to fail to prevent bribery. These laws are complex and far-reaching in nature, and, as a result, we cannot assure you that we would not be required in the future to alter one or more of our practices to be in compliance with these laws or any changes in these laws or the interpretation thereof. Any violations of these laws, or allegations of such violations, could disrupt our operations, involve significant management distraction, involve significant costs and expenses, including legal fees, and could result in a material adverse effect on our business, prospects, financial condition or results of operations. We could also incur severe penalties, including criminal and civil penalties, disgorgement and other remedial measures.

Risks related to our intellectual property

One of ArcherDX's competitors has alleged that its Anchored Multiplex PCR, or AMP, chemistry and products using AMP are infringing on its intellectual property, and ArcherDX may be required to redesign the technology, obtain a license, cease using the AMP chemistry altogether and/or pay significant damages, among other consequences, any of which would have a material adverse effect on ArcherDX's business as well as our financial condition and results of operations, and the intended benefits of our acquisition of ArcherDX.

ArcherDX's AMP chemistry underlies all of its RUO products and is also the foundation of STRATAFIDE and Personalized Cancer Monitoring, or PCM. On January 27, 2020, one of ArcherDX's competitors, Natera, Inc., or Natera, filed a complaint against ArcherDX in the United States District Court for the District of Delaware, alleging that ArcherDX's products using AMP chemistry, and the manufacture, use, sale, and offer for sale of such products, infringe U.S. Patent No. 10,538,814. On April 15, 2020, Natera amended its complaint to allege that ArcherDX's products using AMP chemistry and the manufacture, use, sale, and offer for sale of such products, infringe U.S. Patent No. 10,538,814, U.S. Patent No. 10,557,172, U.S. Patent No. 10,590,482, and U.S. Patent No. 10,597,708, each of which are held by Natera. On August 6, 2020, Natera filed another complaint against ArcherDX in the United States District Court for the District of Delaware alleging that ArcherDX's products using AMP chemistry, and the manufacture, use, sale, and offer for sale of such products, infringe U.S. Patent No. 10,731,220 (together with U.S. Patent Nos. 10,538,814, 10,557,172, 10,590,482, and 10,597,708, the "Natera Asserted Patents.") Natera seeks, among other things, damages and other monetary relief, costs and attorneys' fees, and an order enjoining ArcherDX from further infringement of The Natera Asserted Patents. On October 13, 2020, the court issued an order denying ArcherDX's motion for dismissal of Natera's infringement claims against STRATAFIDE, PCM, and ArcherMET, and declined to enter judgment that U.S. Patent No. 10,538,814, U.S. Patent No. 10,557,172, and U.S. Patent No. 10,590,482 are invalid. On January 12, 2021, the court issued an order granting Natera leave to amend its complaint to add Invitae as a co-defendant and plead allegations that ArcherDX and Invitae induce end-users to infringe the patents-in-suit. Natera filed its Second Amended Complaint on the same day and served Invitae on January 15, 2021. The litigations have now been consolidated for all purposes. A claim construction briefing is complete, and a hearing was held on April 26, 2021. Discovery is ongoing, and trial has been scheduled for May 2022.

In addition, on October 6, 2020, Natera filed a complaint against Genosity in the United States District Court for the District of Delaware, alleging that Genosity's use of its AsTra products, and the manufacture, use, sale, and offer for sale of such products, infringes U.S. Patent No. 10,731,220. Natera's complaint further alleges that Genosity's accused products use ArcherDX's ctDNA and region-specific primers. Genosity filed an answer to the complaint on February 15, 2021, denying Natera's allegations and setting forth affirmative defenses and counterclaims of non-infringement, invalidity and unenforceability due to inequitable conduct. On March 8, 2021, Natera filed a motion to dismiss and strike certain affirmative defenses and counterclaims brought by Genosity relating to inequitable conduct. The court has not yet issued a decision. No case schedule has been set.

If any of ArcherDX's products or ArcherDX's use of AMP chemistry is found to infringe any of the Natera Asserted Patents, it could be required to redesign its technology or obtain a license from Natera to continue developing, manufacturing, marketing, selling and commercializing AMP and its products. However, ArcherDX may not be successful in the redesign of its technology or able to obtain any such license on commercially reasonable terms or at all. Even if ArcherDX were able to obtain a license, it could be non-exclusive, thereby giving Natera and other third parties the right to use the same technologies licensed to ArcherDX, and it could require ArcherDX to make substantial licensing, royalty and other payments. ArcherDX also could be forced, including by court order, to permanently cease developing, manufacturing, marketing and commercializing ArcherDX's products that are found to be infringing. In addition, ArcherDX could be found liable for significant monetary damages, including treble damages and attorneys' fees, if ArcherDX is found to have willfully infringed any of the Natera Asserted Patents. Even if ArcherDX were ultimately to prevail, litigation with Natera could require us to divert substantial financial and management resources that we would otherwise be able to devote to our business.

We cannot reasonably estimate the final outcome, including any potential liability or any range of potential future charges associated with these litigations. However, any finding of infringement by ArcherDX of any of the Natera Asserted Patents could have a material adverse effect on the business of ArcherDX and the benefits we expected to achieve through our acquisition of ArcherDX, as well as our financial condition and results of operations.

Litigation or other proceedings or third-party claims of intellectual property infringement or misappropriation will require us to spend significant time and money, and could in the future prevent us from selling our tests or impact our stock price.

Our commercial success will depend in part on our avoiding infringement of patents and proprietary rights of third parties, including for example the intellectual property rights of competitors. As we continue to commercialize our tests in their current or an updated form, launch different and expanded tests, and enter new markets, competitors might claim that our tests infringe or misappropriate their intellectual property rights as part of business strategies designed to impede our successful commercialization and entry into new markets. Our activities may be subject to claims that we infringe or otherwise violate patents or other intellectual property rights owned or controlled by third parties. For example, as discussed in the preceding risk factor, we are currently engaged in litigation with a competitor of ArcherDX alleging infringement. We cannot assure you that our operations do not, or will not in the future, infringe existing or future patents. We may be unaware of patents that a third party, including for example a competitor in the genetic testing market, might assert are infringed by our business. There may also be patent applications that, if issued as patents, could be asserted against us. Third parties making claims against us for infringement or misappropriation of their intellectual property rights may seek and obtain injunctive or other equitable relief, which could effectively block our ability to perform our tests. Further, if a patent infringement suit were brought against us, we could be forced to stop or delay our development or sales of any tests or other activities that are the subject of such suit. Defense of these claims, regardless of merit, could cause us to incur substantial expenses and be a substantial diversion of our employee resources. Any adverse ruling or perception of an adverse ruling in defending ourselves could have a material adverse impact on our business and stock price. In the event of a successful claim of infringement against us by a third party, we may have to (1) pay substantial damages, possibly including treble damages and attorneys' fees if we are found to have willfully infringed patents; (2) obtain one or more licenses, which may not be available on commercially reasonable terms (if at all); (3) pay royalties; and/or (4) redesign any infringing tests or other activities, which may be impossible or require substantial time and monetary expenditure, all of which could have a material adverse impact on our cash position and business and financial condition.

If licenses to third-party intellectual property rights are or become required for us to engage in our business, we may be unable to obtain them at a reasonable cost, if at all. Even if such licenses are available, we could incur substantial costs related to royalty payments for licenses obtained from third parties, which could negatively affect our gross margins. Moreover, we could encounter delays in the introduction of tests while we attempt to develop alternatives. Defense of any lawsuit or failure to obtain any of these licenses on favorable terms could prevent us from commercializing tests, which could materially affect our ability to grow and thus adversely affect our business and financial condition.

Developments in patent law could have a negative impact on our business.

Although we view current U.S. Supreme Court precedent to be aligned with our belief that naturally occurring DNA sequences and detection of natural correlations between observed facts (such as patient genetic data) and an understanding of that fact's implications (such as a patient's risk of disease associated with certain genetic variations) should not be patentable, it is possible that subsequent determinations by the U.S. Supreme Court or other federal courts could limit, alter or potentially overrule current law. Moreover, from time to time the U.S. Supreme Court, other federal courts, the U.S. Congress or the U.S. Patent and Trademark Office, or USPTO, may change the standards of patentability, and any such changes could run contrary to, or otherwise be inconsistent with, our belief that naturally occurring DNA sequences and detection of natural correlations between observed facts and an understanding of that fact's implications should not be patentable, which could result in third parties newly claiming that our business practices infringe patents drawn from categories of patents which we currently view to be invalid as directed to unpatentable subject matter. For example, the U.S. Senate Judiciary Committee, Subcommittee on Intellectual Property held hearings in 2019 regarding a legislative proposal that would overrule current U.S. Supreme Court precedent concerning the scope of patentable subject matter. Our President and Chief Executive Officer, Sean George, appeared before this subcommittee. If such proposal were to be formulated as a bill and enacted into law, there could be an increase in third-party claims to patent rights over correlations between patient genetic data and its interpretation and such third parties may assert that our business practices infringe some of those resulting patent rights.

Our inability to effectively protect our proprietary technologies, including the confidentiality of our trade secrets, could harm our competitive position.

We currently rely upon trade secret protection and copyright, as well as non-disclosure agreements and invention assignment agreements with our employees, consultants and third parties, and to a limited extent patent protection, to protect our confidential and proprietary information. Although our competitors have utilized and are expected to continue utilizing similar methods and have aggregated and are expected to continue to aggregate similar databases of genetic testing information, our success will depend upon our ability to develop proprietary methods and databases and to defend any advantages afforded to us by such methods and databases relative to our competitors. If we do not protect our intellectual property adequately, competitors may be able to use our methods and databases and thereby erode any competitive advantages we may have.

We will be able to protect our proprietary rights from unauthorized use by third parties only to the extent that our proprietary technologies are covered by valid and enforceable patents or are effectively maintained as trade secrets. In this regard, we have applied, and we intend to continue applying, for patents covering such aspects of our technologies as we deem appropriate. However, we expect that potential patent coverage we may obtain will not be sufficient to prevent substantial competition. In this regard, we believe it is probable that others will independently develop similar or alternative technologies or design around those technologies for which we may obtain patent protection. In addition, any patent applications we file may be challenged and may not result in issued patents or may be invalidated or narrowed in scope after they are issued. Questions as to inventorship or ownership may also arise. Any finding that our patents or applications are unenforceable could harm our ability to prevent others from practicing the related technology, and a finding that others have inventorship or ownership rights to our patents and applications could require us to obtain certain rights to practice related technologies, which may not be available on favorable terms, if at all. If we initiate lawsuits to protect or enforce our patents, or litigate against third-party claims, which would be expensive, and, if we lose, we may lose some of our intellectual property rights. Furthermore, these lawsuits may divert the attention of our management and technical personnel.

We expect to rely primarily upon trade secrets and proprietary know-how protection for our confidential and proprietary information, and we have taken security measures to protect this information. These measures, however, may not provide adequate protection for our trade secrets, know-how or other confidential information. Among other things, we seek to protect our trade secrets and confidential information by entering into confidentiality agreements with employees and consultants. There can be no assurance that any confidentiality agreements that we have with our employees and consultants will provide meaningful protection for our trade secrets and confidential information or will provide adequate remedies in the event of unauthorized use or disclosure of such information. Accordingly, there also can be no assurance that our trade secrets will not otherwise become known or be independently developed by competitors. Enforcing a claim that a party illegally disclosed or misappropriated a trade secret can be difficult, expensive and time-consuming, and the outcome is unpredictable. In addition, trade secrets may be independently developed by others in a manner that could prevent legal recourse by us. If any of our confidential or proprietary information, such as our trade secrets, were to be disclosed or misappropriated, or if any such information was independently developed by a competitor, our competitive position could be harmed.

We may not be able to enforce our intellectual property rights throughout the world.

The laws of some foreign countries do not protect proprietary rights to the same extent as the laws of the United States, and many companies have encountered significant challenges in establishing and enforcing their proprietary rights outside of the United States. These challenges can be caused by the absence of rules and methods for the establishment and enforcement of intellectual property rights outside of the United States. In addition, the legal systems of some countries, particularly developing countries, do not favor the enforcement of patents and other intellectual property protection, especially those relating to healthcare. This could make it difficult for us to stop the infringement of our patents, if obtained, or the misappropriation of our other intellectual property rights. For example, many foreign countries have compulsory licensing laws under which a patent owner must grant licenses to third parties. In addition, many countries limit the enforceability of patents against third parties, including government agencies or government contractors. In these countries, patents may provide limited or no benefit. Patent protection must ultimately be sought on a country-by-country basis, which is an expensive and time-consuming process with uncertain outcomes. Accordingly, we may choose not to seek patent protection in certain countries, and we will not have the benefit of patent protection in such countries. Proceedings to enforce our patent rights in foreign jurisdictions could result in substantial costs and divert our efforts and attention from other aspects of our business. Accordingly, our efforts to protect our intellectual property rights in such countries may be inadequate. In addition, changes in the law and legal decisions by courts in the United States and foreign countries may affect our ability to obtain adequate protection for our technology and the enforcement of intellectual property.

Third parties may assert that our employees or consultants have wrongfully used or disclosed confidential information or misappropriated trade secrets.

We employ individuals who were previously employed at universities or genetic testing, diagnostic or other healthcare companies, including our competitors or potential competitors. Although we try to ensure that our employees and consultants do not use the proprietary information or know-how of others in their work for us, we may be subject to claims that we or our employees or consultants have inadvertently or otherwise used or disclosed intellectual property, including trade secrets or other proprietary information, of a former employer or other third parties. Further, we may be subject to ownership disputes in the future arising, for example, from conflicting obligations of consultants or others who are involved in developing our intellectual property. Litigation may be necessary to defend against these claims. If we fail in defending any such claims, in addition to paying monetary damages, we may lose valuable intellectual property rights or personnel. Even if we are successful in defending against such claims, litigation could result in substantial costs and be a distraction to management and other employees.

Risks related to being a public company

We incur increased costs and demands on management as a result of compliance with laws and regulations applicable to public companies, which could harm our operating results.

As a public company, we incur significant legal, accounting and other expenses, including costs associated with public company reporting requirements. In addition, the Sarbanes-Oxley Act of 2002, or the Sarbanes-Oxley Act, as well as rules implemented by the SEC and the New York Stock Exchange, or NYSE, impose a number of requirements on public companies, including with respect to corporate governance practices. The SEC and other regulators have continued to adopt new rules and regulations and make additional changes to existing regulations that require our compliance. In addition, the Dodd-Frank Wall Street Reform and Consumer Protection Act, or the Dodd-Frank Act, enacted in 2010, includes significant corporate governance and executive-compensation-related provisions. Our management and other personnel need to devote a substantial amount of time to these compliance and disclosure obligations. If these requirements divert the attention of our management and personnel from other aspects of our business concerns, they could have a material adverse effect on our business, financial condition and results of operations. Moreover, these rules and regulations applicable to public companies substantially increase our legal, accounting and financial compliance costs, require that we hire additional personnel and make some activities more time consuming and costly. It may also be more expensive for us to obtain director and officer liability insurance.

If we are unable to maintain effective internal control over financial reporting, investors may lose confidence in the accuracy and completeness of our reported financial information and the market price of our common stock may be negatively affected.

We are required to maintain internal control over financial reporting and to report any material weaknesses in such internal controls. Section 404 of the Sarbanes-Oxley Act requires that we evaluate and determine the effectiveness of our internal control over financial reporting and provide a management report on our internal control over financial reporting. If we have a material weakness in our internal control over financial reporting, we may not detect errors on a timely basis and our financial statements may be materially misstated. We have compiled the system and process documentation necessary to perform the evaluation needed to comply with Section 404 of the Sarbanes-Oxley Act. As we acquire companies, we will need to establish proper controls and integrate them into our internal control system. We need to maintain and enhance these processes and controls as we grow and we have required, and may continue to require, additional personnel and resources to do so.

During the evaluation and testing process, if we identify one or more material weaknesses in our internal controls, our management will be unable to conclude that our internal control over financial reporting is effective. Our independent registered public accounting firm is required to issue an attestation report on the effectiveness of our internal control over financial reporting every fiscal year. Even if our management concludes that our internal control over financial reporting is effective, our independent registered public accounting firm may conclude that there are material weaknesses with respect to our internal controls or the level at which our internal controls are documented, designed, implemented or reviewed.

If we are unable to conclude that our internal control over financial reporting is effective, or if our auditors were to express an adverse opinion on the effectiveness of our internal control over financial reporting because we had one or more material weaknesses, investors could lose confidence in the accuracy and completeness of our

financial disclosures, which could cause the price of our common stock to decline. Internal control deficiencies could also result in the restatement of our financial results in the future.

Risks related to our indebtedness

The terms of our credit agreement require us to meet certain operating and financial covenants and place restrictions on our operating and financial flexibility. If we raise additional capital through debt financing, the terms of any new debt could further restrict our ability to operate our business.

In October 2020, we entered into a credit agreement with Perceptive Credit Holdings II, LP, pursuant to which we borrowed an aggregate principal amount of $135.0 million, or the 2020 Term Loan. The 2020 Term Loan is secured by a first priority lien on all of our and our subsidiaries' assets (including our intellectual property) and is guaranteed by our subsidiaries, in each case, excluding certain excluded assets and immaterial subsidiaries. If the 2020 Term Loan is prepaid, we may be required to pay a prepayment fee of up to 6% and a make-whole fee, in each case depending on when the prepayment is made.

The credit agreement restricts our ability to pursue certain mergers, acquisitions, amalgamations or consolidations, other than permitted acquisitions, that we may believe to be in our best interest. In addition, the credit agreement contains financial covenants that require us to maintain a minimum cash balance and minimum quarterly revenue levels. If we default under the credit agreement, the lender will be able to declare all obligations immediately due and payable, including prepayment fees and other obligations. The lender could declare an event of default under the credit agreement upon the occurrence of any event that it interprets as a material adverse change or material adverse effect, each as defined under the credit agreement. Any declaration by the lender of an event of default could significantly harm our business and prospects and could cause the price of our common stock to decline.

If we raise any additional debt financing, the terms of such additional debt could further restrict our operating and financial flexibility.

We have a large amount of debt, servicing our debt requires a significant amount of cash, and our debt service obligations may prevent us from taking actions that we would otherwise consider to be in our best interests.

In September 2019, we issued $350.0 million aggregate principal amount of our convertible senior notes due 2024 in a private placement, in October 2020 we entered into our credit agreement and borrowed $135.0 million through the 2020 Term Loan and in April 2021 we issued $1,150.0 million aggregate principal amount of our convertible senior notes due 2028 in a private placement.

Our substantial leverage could have significant negative consequences for our future operations, including:

- increasing our vulnerability to general adverse economic and industry conditions;
- limiting our ability to obtain additional financial for working capital, acquisitions, research and development expenditures, and general corporate purposes;
- requiring the dedication of a substantial portion of our expected cash flow or our existing cash to service our indebtedness, thereby reducing the amount of our cash available for other purposes;
- limiting our flexibility in planning for, or reacting to, changes in our business and the industry in which we compete; or
- placing us at a possible competitive disadvantage compared to less leveraged competitors and competitors that have better access to capital resources.

Our ability to make scheduled payments of the principal of, to pay interest on or to refinance our indebtedness depends on our future performance, which is subject to economic, financial, competitive and other factors beyond our control. Our business may not generate cash flow from operations in the future sufficient to service our debt and make necessary capital expenditures. If we are unable to generate such cash flow, we may be required to adopt one or more alternatives, such as selling assets, restructuring debt or obtaining additional equity capital on terms that may be onerous or highly dilutive. Our ability to refinance our indebtedness will depend on the capital markets and our financial condition at such time. We may not be able to engage in any of these activities or engage in these activities on desirable terms, which could result in a default on our debt obligations.

We may not have the ability to raise the funds necessary to settle conversions of our convertible senior notes in cash or to repurchase the notes upon a fundamental change, and our current credit agreement contains and our future debt may contain limitations on our ability to pay cash upon conversion or repurchase of the notes.

Holders of our convertible senior notes have the right to require us to repurchase all or any portion of their notes upon the occurrence of a fundamental change at a fundamental change repurchase price equal to 100% of the principal amount of the notes to be repurchased, plus accrued and unpaid interest, if any. In addition, upon conversion of the notes, unless we elect to deliver solely shares of our common stock to settle such conversion (other than paying cash in lieu of delivering any fractional share), we will be required to make cash payments in respect of the notes being converted. However, we only have limited ability to make those cash payments under our credit agreement and, even if the credit agreement limitations are no longer in effect, we may not have enough available cash or be able to obtain financing at the time we are required to make repurchases of notes surrendered therefor or notes being converted. In addition, our ability to repurchase the notes or to pay cash upon conversions of the notes may be limited by law, by regulatory authority or by agreements governing our future indebtedness. Our failure to repurchase notes at a time when the repurchase is required by the indentures governing the notes or to pay any cash payable on future conversions of the notes as required by the indentures would constitute a default under the relevant indenture. A default under an indenture or the occurrence of the fundamental change itself could also lead to a default under our credit agreement and any agreements governing our future indebtedness. If the repayment of the related indebtedness were to be accelerated after any applicable notice or grace periods, we may not have sufficient funds to repay the indebtedness and to repay or repurchase our convertible senior notes.

The conditional conversion feature of our convertible senior notes due 2024, if triggered, may adversely affect our financial condition and operating results.

In the event the conditional conversion feature of our convertible senior notes due 2024 is triggered, such as was the case for the quarter ending March 31, 2021, holders of such notes will be entitled to convert the notes at any time during specified periods at their option. If one or more holders elect to convert their notes, unless we elect to satisfy our conversion obligation by delivering solely shares of our common stock (other than paying cash in lieu of delivering any fractional share), we would be required to settle a portion or all of our conversion obligation through the payment of cash, which could adversely affect our liquidity. In addition, even if holders do not elect to convert their notes, we could be required under applicable accounting rules to reclassify all or a portion of the outstanding principal of the notes as a current rather than long-term liability, which would result in a material reduction of our net working capital.

General risk factors

Our stock price is volatile, and you may not be able to sell shares of our common stock at or above the price you paid.

The trading price of our common stock is volatile and could be subject to wide fluctuations in response to various factors, some of which are beyond our control. These factors include:

- actual or anticipated fluctuations in our operating results;
- competition from existing tests or new tests that may emerge;
- announcements by us or our competitors of significant acquisitions, strategic partnerships, joint ventures, collaborations or capital commitments;
- failure to meet or exceed financial estimates and projections of the investment community or that we provide to the public;
- issuance of new or updated research or reports by securities analysts or changed recommendations for our stock;
- our focus on long-term goals over short-term results;
- the level of short interest in our stock, and the effect of short sellers on the price of our stock;
- the timing and magnitude of our investments in the growth of our business;
- actual or anticipated changes in regulatory oversight of our business;
- additions or departures of key management or other personnel;

- disputes or other developments related to our intellectual property or other proprietary rights, including litigation;
- changes in reimbursement by current or potential payers;
- general economic and market conditions; and
- issuances of significant amounts of our common stock.

In addition, the stock market in general, and the market for stock of life sciences companies in particular, has experienced extreme price and volume fluctuations that have often been unrelated or disproportionate to the operating performance of those companies. Broad market and industry factors, including COVID-19, may seriously affect the market price of our common stock, regardless of our actual operating performance. In addition, in the past, following periods of volatility in the overall market and the market price of a particular company's securities, securities class action litigation has often been instituted against these companies. This litigation, if instituted against us, could result in substantial costs and a diversion of our management's attention and resources.

If securities or industry analysts issue an adverse opinion regarding our stock or do not publish research or reports about our company, our stock price and trading volume could decline.

The trading market for our common stock will depend in part on the research and reports that equity research analysts publish about us and our business. We do not control these analysts or the content and opinions included in their reports. Securities analysts may elect not to provide research coverage of our company and such lack of research coverage may adversely affect the market price of our common stock. The price of our common stock could also decline if one or more equity research analysts downgrade our common stock, change their price targets, issue other unfavorable commentary or cease publishing reports about us or our business. If one or more equity research analysts cease coverage of our company, we could lose visibility in the market, which in turn could cause our stock price to decline.

We have never paid dividends on our capital stock, and we do not anticipate paying dividends in the foreseeable future.

We have never paid dividends on any of our capital stock and currently intend to retain any future earnings to fund the growth of our business. In addition, the terms of our credit agreement restrict our ability to pay dividends. Any determination to pay dividends in the future will be at the discretion of our board of directors and will depend on our financial condition, operating results, capital requirements, general business conditions and other factors that our board of directors may deem relevant. As a result, capital appreciation, if any, of our common stock will be the sole source of gain for the foreseeable future.

Anti-takeover provisions in our charter documents and under Delaware law could discourage, delay or prevent a change in control and may affect the trading price of our common stock.

Provisions in our restated certificate of incorporation and our amended and restated bylaws may have the effect of delaying or preventing a change of control or changes in our management. Our restated certificate of incorporation and amended and restated bylaws include provisions that:

- authorize our board of directors to issue, without further action by the stockholders, up to 20,000,000 shares of undesignated preferred stock;
- require that any action to be taken by our stockholders be effected at a duly called annual or special meeting and not by written consent;
- specify that special meetings of our stockholders can be called only by our board of directors, our chairman of the board or our chief executive officer;
- establish an advance notice procedure for stockholder approvals to be brought before an annual meeting of our stockholders, including proposed nominations of persons for election to our board of directors;
- establish that our board of directors is divided into three classes, Class I, Class II and Class III, with each class serving staggered terms;
- provide that our directors may be removed only for cause;
- provide that vacancies on our board of directors may, except as otherwise required by law, be filled only by a majority of directors then in office, even if less than a quorum; and

- require a super-majority of votes to amend certain of the above-mentioned provisions as well as to amend our bylaws generally.

In addition, we are subject to the provisions of Section 203 of the Delaware General Corporation Law regulating corporate takeovers. Section 203 generally prohibits us from engaging in a business combination with an interested stockholder subject to certain exceptions.

Our certificate of incorporation designates the Court of Chancery of the State of Delaware as the sole and exclusive forum for certain types of actions and proceedings that may be initiated by our stockholders, which could limit our stockholders' ability to obtain a favorable judicial forum for disputes with us or our directors, officers or other employees.

Our certificate of incorporation provides that, unless we consent in writing to the selection of an alternative forum, the Court of Chancery of the State of Delaware shall be the sole and exclusive forum for:

- any derivative action or proceeding brought on our behalf;
- any action asserting a claim of breach of a fiduciary duty owed by any of our directors, officers, or other employees to us or our stockholders;
- any action asserting a claim arising pursuant to any provision of the Delaware General Corporation Law; or
- any action asserting a claim against us governed by the internal affairs doctrine.

Section 27 of the Exchange Act creates exclusive federal jurisdiction over all suits brought to enforce any duty or liability created by the Exchange Act or the rules and regulations thereunder. As a result, the exclusive forum provision in our certificate of incorporation will not apply to suits brought to enforce any duty or liability created by the Exchange Act or any other claim for which the federal courts have exclusive jurisdiction. Section 22 of the Securities Act creates concurrent jurisdiction for federal and state courts over all suits brought to enforce any duty or liability created by the Securities Act or the rules and regulations thereunder. As a result, the exclusive forum provision in our certificate of incorporation will not apply to suits brought to enforce any duty or liability created by the Securities Act or any other claim for which the federal and state courts have concurrent jurisdiction.

Any person or entity purchasing or otherwise acquiring any interest in shares of our capital stock shall be deemed to have notice of and consented to the provisions of our certificate of incorporation described above. This choice of forum provision may limit a stockholder's ability to bring a claim in a judicial forum that it finds favorable for disputes with us or our directors, officers or other employees, which may discourage such lawsuits against us and our directors, officers and other employees. Alternatively, if a court were to find these provisions of our certificate of incorporation inapplicable to, or unenforceable in respect of, one or more of the specified types of actions or proceedings, we may incur additional costs associated with resolving such matters in other jurisdictions, which could adversely affect our business, financial condition or results of operations.

Sales of a substantial number of shares of our common stock in the public market could cause our stock price to fall.

Sales of a substantial number of shares of our common stock in the public market or the perception that these sales might occur could depress the market price of our common stock and could impair our ability to raise capital through the sale of additional equity securities. As of March 31, 2021, we had outstanding 197.5 million shares of our common stock, options to purchase 4.5 million shares of our common stock (of which 4.1 million were exercisable as of that date), outstanding restricted stock units, or RSUs, representing 6.3 million shares of our common stock (which includes an estimated number of RSUs, subject to certain employee's continued service with us, or Time-based RSUs, and RSUs that are performance based RSUs, or PRSUs, granted in connection with an acquisition) and outstanding Series A convertible preferred stock convertible into 0.1 million shares of our common stock. The foregoing does not include shares that may be issuable in connection with indemnification hold-backs and contingent consideration related to our acquisitions other than ArcherDX, up to 22.0 million shares which may be issuable upon the achievement of certain milestones related to our acquisition of ArcherDX, or shares that may be issuable in the future in connection with our convertible senior notes. Also not included are the shares issued or issuable in connection with acquisitions after March 31, 2021, including approximately 1.9 million shares of our common stock that we will register for resale following the filing of this Report. The sale or the availability for sale of a large number of shares of our common stock in the public market could cause the price of our common stock to decline.

ITEM 2. Unregistered Sales of Equity Securities and Use of Proceeds.

During the three months ended March 31, 2021, we issued an aggregate of 1.4 million shares of our common stock upon the closing of the acquisition of One Codex. This issuance was in reliance upon the exemption from registration provided by Section 4(a)(2) of the Securities Act of 1933.

ITEM 6. Exhibits.

Exhibit Number	Description
4.1	Registrations Rights Agreement, dated as of February 8, 2021, by and among the Registrant and certain securityholders of Reference Genomics, Inc. d/b/a One Codex.
10.1#	Invitae Corporation 2015 Stock Incentive Plan, as amended and restated as of March 26, 2021.
31.1	Principal Executive Officer's Certifications Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
31.2	Principal Financial Officer's Certifications Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
32.1*	Certification Pursuant to 18 U.S.C. § 1350 (Section 906 of Sarbanes-Oxley Act of 2002).
32.2*	Certification Pursuant to 18 U.S.C. § 1350 (Section 906 of Sarbanes-Oxley Act of 2002).
101.INS	Inline XBRL Instance Document - the instance document does not appear in the Interactive Data File because its XBRL tags are embedded within the Inline XBRL document.
101.SCH	Inline XBRL Taxonomy Extension Schema
101.CAL	Inline XBRL Taxonomy Extension Calculation Linkbase
101.DEF	Inline XBRL Taxonomy Extension Definition Linkbase
101.LAB	Inline XBRL Taxonomy Extension Label Linkbase
101.PRE	Inline XBRL Taxonomy Extension Presentation Linkbase
104	Cover Page Interactive Data File (the cover page XBRL tags are embedded within the Inline XBRL document).

# Indicates a management contract or compensatory plan or arrangement.

* In accordance with Item 601(b)(32)(ii) of Regulation S-K and SEC Release No. 34-47986, the certifications furnished in Exhibits 32.1 and 32.2 hereto are deemed to accompany this Form 10-Q and will not be deemed "filed" for purposes of Section 18 of the Securities Exchange Act of 1934 (the "Exchange Act") or deemed to be incorporated by reference into any filing under the Exchange Act or the Securities Act of 1933 except to the extent that the registrant specifically incorporates it by reference.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

INVITAE CORPORATION

By: /s/ Sean E. George, Ph.D.
Sean E. George, Ph.D.
President and Chief Executive Officer
Principal Executive Officer

By: /s/ Shelly D. Guyer
Shelly D. Guyer
Chief Financial Officer
Principal Financial Officer

Date: May 4, 2021

Exhibit 4.1

REGISTRATION RIGHTS AGREEMENT

This Registration Rights Agreement (this "**Agreement**") is made and entered into as of April 16, 2021 (the "**Effective Date**") by and among Invitae Corporation, a Delaware corporation (the "**Company**"), and certain securityholders of Genosity Inc., a Delaware corporation ("**Genosity**") listed on Exhibit A hereto (each such securityholder, as well as any permitted transferee of Registrable Securities (as defined below) hereunder, in each case to the extent holding Registrable Securities, a "**Holder**" and collectively, the "**Holders**"). Terms used but not otherwise defined herein shall have the meaning ascribed to such terms in the Merger Agreement (as defined below).

RECITALS

WHEREAS, the Company, Genosity, Grenada Merger Sub A Inc., a Delaware corporation and wholly owned subsidiary of the Company ("**Merger Sub A**"), Grenada Merger Sub B LLC, a Delaware limited liability company and wholly owned subsidiary of the Company ("**Merger Sub B**"), and Marc D. Grodman as the Stockholders' Representative (as defined therein), have entered into that certain Agreement and Plan of Merger and Plan of Reorganization dated as of April 1, 2021 (the "**Merger Agreement**"), pursuant to which (i) Merger Sub A will be merged with and into Genosity, and Genosity shall continue as the surviving entity and wholly owned subsidiary of the Company (the "**Reverse Merger**") and (ii) promptly thereafter as part of the same overall transaction, and in all cases on the Closing Date, Genosity will be merged with and into Merger Sub B, and Merger Sub B shall continue as the surviving entity and wholly owned subsidiary of the Company (the "**Forward Merger**" and, together with the Reverse Merger, the "**Mergers**");

WHEREAS, in connection with the Mergers and pursuant to the Merger Agreement, the Company issued to the Holders at the Closing shares of the Company's common stock, par value $0.0001 per share, identified on Exhibit A hereto as Stock Consideration Shares (the "**Shares**") pursuant to the Merger Agreement; and

WHEREAS, in connection with the consummation of the transactions contemplated by the Merger Agreement, the Company agreed to grant certain registration rights to the Holders as set forth in this Agreement.

NOW, THEREFORE, in consideration of the mutual covenants and agreements contained herein, the parties agree as follows:

ARTICLE I
DEFINITIONS

Section 1.1 Definitions. For purposes of this Agreement, the following terms and variations thereof have the meanings set forth below:

"**Affiliate**" means, with respect to any person, any other person that, directly or indirectly, controls, or is controlled by, or is under common control with, such person. For this purpose: (a) "control" (including, with its correlative meanings, "controlled by" and "under common control with") means the possession, directly or indirectly, of the power to direct or cause the direction of management or policies of a Person, whether through the ownership of securities or partnership or other ownership interests, by contract or otherwise; and (b) "person" means any natural person, corporation, limited liability company, partnership, association, trust or other entity.

"**Agreement**" has the meaning set forth in the preamble.

"**Business Day**" means any day, other than a Saturday, Sunday or one on which banks are authorized by law to be closed in New York, New York.

"**Company**" has the meaning set forth in the preamble.

"**Company Indemnitee**" has the meaning set forth in Section 4.1(b).

"**Effective Date**" has the meaning set forth in the preamble.

"**Effectiveness Period**" has the meaning set forth in Section 3.1(b).

"**Exchange Act**" means the Securities Exchange Act of 1934.

"**Genosity**" has the meaning set forth in the preamble.

"**Grace Period**" has the meaning set forth in Section 3.2(h).

"**Holder**" has the meaning set forth in the preamble.
"**Holder Indemnitee**" has the meaning set forth in Section 4.1(a).

"**Indemnified Party**" has the meaning set forth in Section 4.1(c).

"**Indemnifying Party**" has the meaning set forth in Section 4.1(c).

"**Merger Agreement**" has the meaning set forth in the recitals.

"**Registrable Securities**" means, at any time, the Shares issued to the Holders pursuant to the Merger Agreement and any securities issued or issuable upon any stock split, dividend or other distribution, recapitalization or similar event with respect to such securities; provided, however, that Registrable Securities shall cease to be Registrable Securities with respect to a particular Holder when (i) such securities have been disposed of in accordance with the Registration Statement or pursuant to Rule 144; (ii) such securities may be sold pursuant to

Rule 144 without any manner-of-sale restrictions or volume limitations; or (iii) such securities cease to be outstanding.

"**Registration Expenses**" means all expenses incurred by the Company in effecting the registration pursuant to this Agreement, including all registration and filing fees, printing expenses, fees and disbursements of counsel for the Company, "blue sky" fees and expenses, and expenses of the Company's independent registered public accounting firm in connection with any regular or special reviews or audits incident to or required by any such registration, but shall not include Selling Expenses.

"**Registration Statement**" has the meaning set forth in Section 3.1.

"**Rule 144**" means Rule 144 under the Securities Act or any successor or other similar rule, regulation or interpretation of the SEC that may at any time permit the sale of Registrable Securities to the public without registration.

"**Rule 405**" means Rule 405 under the Securities Act or any successor or other similar rule.

"**Rule 415**" means Rule 415 under the Securities Act or any successor or other similar rule providing for offering securities on a continuous or delayed basis.

"**Rule 424**" means Rule 424 under the Securities Act or any successor or other similar rule.

"**Shares**" has the meaning set forth in the recitals.

"**SEC**" means the Securities and Exchange Commission.

"**Securities Act**" means the Securities Act of 1933.

"**Selling Expenses**" means all discounts, selling commissions, fees of selling brokers, dealer managers and similar securities industry professionals and stock transfer taxes applicable to the sale of Registrable Securities and fees and disbursements of counsel for any Holder (other than the fees and disbursements of counsel for the Company included in Registration Expenses).

"**Transfer**" means, directly or indirectly, to sell, transfer, assign, pledge, encumber, hypothecate or similarly dispose of (by merger, testamentary disposition, operation of law or otherwise), either voluntarily or involuntarily, or to enter into any contract, option or other arrangement or understanding with respect to the sale, transfer, assignment, pledge, encumbrance, hypothecation or similar disposition of (by merger, testamentary disposition, operation of law or otherwise) any Shares.

"**Violation**" has the meaning set forth in Section 4.1(a).

ARTICLE II
TRANSFER RESTRICTIONS

Section 2.1 General Transfer Restrictions. The right of any Holder to Transfer any Shares held by it is subject to the restrictions set forth below.

(a) Each Holder acknowledges that the Shares have not been registered under the Securities Act and may not be Transferred except pursuant to an effective registration statement under the Securities Act or pursuant to an exemption from registration under the Securities Act. Each Holder covenants that the Shares will only be disposed of pursuant to an effective registration statement under, and in compliance with the requirements of, the Securities Act or pursuant to an available exemption from the registration requirements of the Securities Act, and in compliance with any applicable state and foreign securities laws. In connection with any Transfer of the Shares other than a Transfer (i) pursuant to an effective registration statement, (ii) to the Company, or (iii) pursuant to Rule 144, the Company may require the Holder to provide to the Company an opinion of counsel selected by the Holder and reasonably acceptable to the Company, the form and substance of which opinion shall be reasonably satisfactory to the Company, to the effect that such Transfer does not require registration under the Securities Act.

(b) Each Holder agrees to the affixing, so long as is required by this Section 2.1, of the following legend on any certificate or book-entry position evidencing any of the Shares:

> **THESE SECURITIES HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED (THE "ACT"), OR ANY STATE SECURITIES LAWS AND MAY NOT BE TRANSFERRED IN THE ABSENCE OF SUCH REGISTRATION OR AN EXEMPTION THEREFROM UNDER THE ACT AND THE RULES AND REGULATIONS THEREUNDER AND APPLICABLE STATE SECURITIES LAWS.**

Certificates or book-entry positions evidencing the Shares shall not be required to contain such legend or any other legend (i) following any sale of such Shares pursuant to an effective registration statement (including the Registration Statement described in Section 3.1) covering the resale of the Shares, (ii) following any sale of such Shares pursuant to Rule 144 or if the Shares are transferrable by a person who is not an Affiliate of the Company or the applicable Holder pursuant to Rule 144 without any volume or manner of sale restrictions thereunder, (iii) if Holder is not an Affiliate of the Company, six (6) months following the Closing, provided, however, that in the case of (i), (ii) and (iii), above, the Holder provides the Company with customary legal representation letters reasonably acceptable to the Company, or (iv) if the Holder provides the Company with a legal opinion reasonably acceptable to the Company to the effect that the legend is not required under applicable requirements of the Securities Act. Whenever such restrictions shall cease and terminate as to any Shares, (x) the Holder of such securities shall be entitled to receive from the Company upon a written request in writing, without expense, new securities of like tenor not bearing the legend set forth herein and such new

securities shall be issued promptly, but in no event less than five (5) Business Days after a written request to remove such legends and (y) the Company or its counsel shall, at the Company's expense, provide any opinion that may be required by the Company's transfer agent in connection with the removal of such legend.

(c) Notwithstanding anything herein to the contrary, following registration of the Shares, each Holder agrees not to sell any Shares issued to such Holder if the sales of such Shares would, when combined with the sale of any other Shares by such Holder in any one (1) day period, exceed five percent (5%) of the average daily trading volume of the Company's common stock on the New York Stock Exchange over the five (5) trading days immediately preceding such date of sale; provided, however, that if the aggregate number of Shares represents less than fifty percent (50%) of the average daily trading volume of the Company's common stock on the New York Stock Exchange over the five (5) trading days preceding the Closing Date (the "**Average Volume**"), such resale volume limitations shall not apply. The Company may place such legends or stock transfer restrictions on the Shares as shall be appropriate for enforcing the provisions of this Section 2(c).

ARTICLE III
REGISTRATION AND PROCEDURES

Section 3.1 S-3 Registration.

(a) In compliance with the terms of this Agreement, the Company shall prepare and file with the SEC a registration statement on Form S-3ASR (or such other form that the Company is then eligible to use if not eligible to use Form S-3ASR) covering the resale as a secondary offering to be made on a continuous basis pursuant to Rule 415 of all Registrable Securities. The registration statement (or new registration statement) required to be filed pursuant to this Section 3.1, together with any amendments and supplements to such registration statement, including post-effective amendments, and all exhibits and all materials incorporated by reference in such registration statement other than a registration statement on Form S-4 or S-8, is referred to herein as the "**Registration Statement**."

(b) The Company shall exercise commercially reasonable efforts to prepare and file the Registration Statement with the SEC no later than fifteen (15) Business Days after the Closing Date; provided, however, that no filing of such Registration Statement shall be required (i) during any period in which the Company's insider trading policy would prohibit executive officers of the Company from trading in the Company's securities, or (ii) prior to the date which is two (2) Business Days following the Company's first filing with the SEC after the Closing Date of an Annual Report on Form 10-K or a Quarterly Report on Form 10-Q. Subject to the terms of this Agreement, the Company shall use commercially reasonable efforts to have the Registration Statement declared effective as soon as practicable after such filing if not otherwise effective upon filing and to keep the Registration Statement continuously effective and in compliance with the Securities Act and usable for resale of Registrable Securities covered thereby from the date of its initial effectiveness until the earlier of (i) the date on which such Registrable Securities have been disposed of in accordance with the Registration Statement or pursuant to Rule 144 or (ii) such Registrable Securities may be sold pursuant to Rule 144 without

any limitation as to manner-of-sale restrictions or volume limitations (such period, the "**Effectiveness Period**"); provided, however, that nothing in this Agreement shall require the Company to maintain any Registration Statement once the Shares cease to be Registrable Securities.

(c) It shall be a condition precedent to the obligations of the Company to take any action pursuant to Section 3.1 or Section 3.2 with respect to Registrable Securities of a Holder that the Holder shall furnish to the Company such information regarding such Holder as required under Section 3.4(a).

Section 3.2 Registration Procedures; Company Obligations. The Company shall use commercially reasonable efforts to effect the registration of the Registrable Securities in accordance with Section 3.1, and in connection therewith shall have the following obligations:

(a) No later than the first Business Day after the Registration Statement becomes effective, the Company shall file with the SEC the final prospectus included therein pursuant to Rule 424. The Registration Statement, including any preliminary prospectus or final prospectus contained therein or any amendments or supplements thereto, shall comply as to form and content with the applicable requirements of the Securities Act and shall not contain any untrue statement of a material fact or omit to state a material fact required to be stated therein, or necessary to make the statements therein, in light of the circumstances in which they were made, not misleading.

(b) Subject to Section 3.2(h), the Company shall prepare and file with the SEC such amendments and supplements to the Registration Statement and the prospectus used in connection with the Registration Statement as may be necessary to keep the Registration Statement effective and usable for resale of the Registrable Securities covered thereby at all times during the Effectiveness Period. The Company shall use commercially reasonable efforts to cause any post-effective amendment to the Registration Statement that is not effective upon filing to become effective as soon as practicable after such filing. No later than the first Business Day after a post-effective amendment to the Registration Statement becomes effective, the Company shall file with the SEC the final prospectus or prospectus supplement included therein pursuant to Rule 424.

(c) The Company shall as promptly as practicable notify the Holders of the time when the Registration Statement becomes effective or an amendment or supplement to any prospectus forming a part of such Registration Statement has been filed. The Company shall furnish to the Holders, without charge, such documents, including copies of any preliminary prospectus or final prospectus contained in the Registration Statement or any amendments or supplements thereto, as such Holder may reasonably request from time to time in order to facilitate the disposition of the Registrable Securities covered by the Registration Statement.

(d) The Company shall use commercially reasonable efforts to register or qualify, and cooperate with the Holders of Registrable Securities covered by the Registration Statement in connection with the registration or qualification of such Registrable Securities for

offer and sale under the securities or "blue sky" laws of each state and other jurisdiction of the United States as any such Holder reasonably requests in writing, and do any and all other things reasonably necessary or advisable to keep such registration or qualification in effect; provided, however, that the Company shall not be required to qualify generally to do business in any jurisdiction where it is not then so qualified or take any action which would subject it to taxation or general service of process in any such jurisdiction where it is not then so subject.

(e) The Company shall promptly notify (which notice shall be accompanied by an instruction to suspend the use of the prospectus) the Holders when a prospectus relating thereto is required to be delivered under the Securities Act of the happening of any event as a result of which any prospectus included in, or relating to, the Registration Statement, as then in effect, includes an untrue statement of a material fact or omits to state a material fact required to be stated therein, or necessary to make the statements therein, in light of the circumstances in which they were made, not misleading (provided that in no event shall such notice contain any material, non-public information), and, subject to Section 3.2(h), promptly prepare and file with the SEC a supplement to the related prospectus or amendment to such Registration Statement or any other required document so that, as thereafter delivered to the Holders, the prospectus will not contain an untrue statement of a material fact or omit to state any material fact required to be stated therein, or necessary to make the statements therein, in light of the circumstances under which they were made, not misleading.

(f) The Company shall use commercially reasonable efforts to prevent the issuance of any stop order or other suspension of effectiveness of the Registration Statement, or the suspension of the qualification of any of the Registrable Securities for sale in any jurisdiction and, if such an order or suspension is issued, to obtain the withdrawal of such order or suspension as soon as reasonably practicable and to notify the Holders of the issuance of such order and the resolution thereof or its receipt of actual notice of the initiation or threat of any proceeding for such purpose.

(g) The Company shall use commercially reasonable efforts to cause the Registrable Securities covered by the Registration Statement to be (i) listed on the New York Stock Exchange and (ii) reflected in the stock ledger maintained by the Company's transfer agent.

(h) Notwithstanding anything in this Agreement to the contrary, at any time after the Registration Statement becomes effective the Company may delay the disclosure of material, non-public information concerning the Company or any of its subsidiaries if the Board of Directors of the Company has a valid business reason for determining that disclosure of such information is not in the best interests of the Company and such disclosure is not otherwise required (a "**Grace Period**"); provided, however, that the Company shall promptly (i) provide written notice to the Holders of the Grace Period (provided that in no event shall such notice contain any material, non-public information) and the date on which the Grace Period will begin, (ii) use commercially reasonable efforts to terminate a Grace Period as promptly as possible, and (iii) provide written notice to the Holders of the date on which the Grace Period ends; provided, further, that no Grace Period shall exceed thirty (30) consecutive days and during any twelve

(12) month period such Grace Periods shall not exceed an aggregate of sixty (60) days; provided, further, the Company shall not register any securities for its own account or that of any other stockholder during such Grace Period. The provisions of Section 3.2(e) shall not be applicable during any Grace Period. Upon expiration of a Grace Period, the Company shall again be bound by the provisions of Section 3.2(e) with respect to the information giving rise thereto unless such material, non-public information is no longer applicable.

Section 3.3 Current Public Information. During the Effectiveness Period, the Company shall use commercially reasonable efforts to (i) make and keep public information available, as those terms are defined in Rule 144, until all the Registrable Securities cease to be Registrable Securities, and so long as a Holder owns any Registrable Securities, furnish to such Holder upon request a written statement by the Company as to its satisfaction of the current public information requirements of Rule 144 and (ii) file with the SEC in a timely manner all reports and other documents required to be filed by the Company under the Securities Act and the Exchange Act; and (iii) take such further action as any Holder may reasonably request, to the extent required from time to time to enable the Holders to sell Registrable Securities without registration under the Securities Act within the limitations of the exemption provided by Rule 144.

Section 3.4 Obligations of the Holders.

(a) Each Holder shall furnish in writing to the Company such information regarding such Holder, the Registrable Securities held by such Holder and the intended method of disposition of the Registrable Securities held by such Holder as shall be reasonably required to effect the registration of such Registrable Securities and shall execute, or shall cause to be executed, such customary documents in connection with such registration as the Company may reasonably request. In connection therewith, upon the execution of this Agreement, each Holder shall complete, execute and deliver to the Company a selling securityholder notice and questionnaire in the form attached hereto as Exhibit B. At least five (5) Business Days prior to the first anticipated filing date of the Registration Statement, the Company shall notify each Holder of any additional information the Company requires from such Holder, and such Holder shall provide such information to the Company at least three (3) Business Days prior to the first anticipated filing date of the Registration Statement.

(b) Each Holder agrees to cooperate with the Company as reasonably requested by the Company in connection with the preparation and filing of the Registration Statement.

(c) Upon receipt of written notice from the Company of any event of the kind described in Section 3.2(e) or Section 3.2(f) or written notice of any Grace Period, each Holder shall forthwith discontinue disposition of Registrable Securities until such Holder has received copies of a supplemented or amended prospectus or until such Holder is advised in writing by the Company that the use of the prospectus may be resumed or that the Grace Period has ended. If so directed by the Company, such Holder shall use its commercially reasonable efforts to return to the Company (at the Company's expense) all copies of the prospectus covering such

Registrable Securities current at the time of receipt of such notice other than permanent file copies then in such Holder's possession.

(d) No Holder shall use any free writing prospectus (as defined in Rule 405) in connection with the sale of Registrable Securities without the prior written consent of the Company.

(e) Each Holder covenants and agrees that it will comply with the prospectus delivery requirements of the Securities Act as applicable to it or an exemption therefrom in connection with sales of Registrable Securities pursuant to any Registration Statement.

Section 3.5 Expenses of Registration. All Registration Expenses incurred in connection with any registration, qualification or compliance hereunder shall be borne by the Company. All Selling Expenses incurred in connection with any registration hereunder shall be borne by the Holders of the Registrable Securities so registered in proportion to the Registrable Securities owned by such Holders.

Section 3.6 Transfer of Registration Rights. The rights contained in Section 3.1 hereof to cause the Company to register the Registrable Securities, and the other rights set forth in this Article III, may be assigned or otherwise conveyed by any Holder to any transferee of the Registrable Securities if the Transfer was permitted under Article II and the transferee agrees with the Company in writing to be bound by this Agreement.

ARTICLE IV
INDEMNIFICATION AND CONTRIBUTION

Section 4.1 Indemnification. In the event any Registrable Securities are included in the Registration Statement:

(a) The Company shall indemnify and hold harmless each Holder of Registrable Securities and such Holder's officers, directors, employees, partners, members, agents (including brokers), representatives and Affiliates and each person, if any, who controls such Holder within the meaning of the Securities Act or the Exchange Act (each, a "**Holder Indemnitee**"), against any losses, claims, damages, liabilities or expenses to which they may become subject under the Securities Act, the Exchange Act or other federal or state law, insofar as such losses, claims, damages, or liabilities (or actions in respect thereof) arise out of or are based upon any of the following statements, omissions or violations (collectively, a "**Violation**"): (i) an untrue statement or alleged untrue statement of a material fact contained in the Registration Statement, including any preliminary prospectus or final prospectus contained therein or any amendments or supplements thereto or any documents incorporated therein by reference, (ii) an omission or alleged omission to state therein a material fact required to be stated therein, or necessary to make the statements therein, in light of the circumstances in which they were made, not misleading, and (iii) a violation or alleged violation by the Company or its agents of any rule or regulation promulgated under the Securities Act or the Exchange Act applicable to the Company or its agents and relating to action or inaction required of the Company in connection with the Registration Statement, and the Company will pay to each such

Holder Indemnitee, as accrued, any legal or other expenses reasonably incurred by he, she or it in connection with investigating or defending any such loss, claim, damage, liability, action or expense; provided, however, that the indemnification contained in this Section 4.1(a) shall not apply to amounts paid in settlement of any such loss, claim, damage, liability, action or expense if such settlement is effected without the consent of the Company (which consent shall not be unreasonably withheld, conditioned or delayed), nor shall the Company be liable for any such loss, claim, damage, liability, action or expense to the extent that it arises out of or is based upon a Violation which occurs (A) in reliance upon and in conformity with written information furnished by a Holder, (B) in connection with any failure of such person to deliver or cause to be delivered a prospectus made available by the Company in a timely manner, (C) in connection with any offers or sales effected by or on behalf of any Holder Indemnitee in violation of Section 3.4(c), or (D) as a result of offers or sales effected by or on behalf of any Holder Indemnitee by means of a free writing prospectus (as defined in Rule 405) that was not authorized in writing by the Company. Such indemnity shall remain in full force and effect regardless of any investigation made by or on behalf of any such Holder Indemnitee, and shall survive the transfer of such securities by such Holder, and any termination of this Agreement.

(b) Each Holder, severally and not jointly, shall indemnify and hold harmless the Company and each of its officers, directors, employees, agents, representatives and Affiliates and persons, if any, who control the Company within the meaning of the Securities Act or the Exchange Act (each, a "**Company Indemnitee**"), against any losses, claims, damages, liabilities or expenses to which any of the Company Indemnitees may become subject under the Securities Act, the Exchange Act or other federal or state law, insofar as such losses, claims, damages, or liabilities (or actions in respect thereof) arise out of or are based upon any (i) untrue statement or alleged untrue statement of a material fact regarding such Holder and provided in writing by such Holder which is contained in the Registration Statement, including any preliminary prospectus or final prospectus contained therein or any amendments or supplements thereto, (ii) the omission or alleged omission to state therein a material fact required to be stated therein, or necessary to make the statements therein, in light of the circumstances in which they were made, not misleading, in each case to the extent (and only to the extent) that such untrue statement or alleged untrue statement or omission or alleged omission was made in the Registration Statement, preliminary or final prospectus, amendment or supplement thereto, in reliance upon and in conformity with written information furnished by such Holder, (iii) a violation or alleged violation by a Holder of any rule or regulation promulgated under the Securities Act or the Exchange Act applicable to such Holder and relating to action or inaction required of such Holder in connection with the registration of such Holder's Registrable Securities or (iv) in connection with any offers or sales effected by or on behalf of any Holder Indemnitee in violation of Section 3.4(c), and each Holder will pay, as accrued, any legal or other expenses reasonably incurred by any Company Indemnitee pursuant to this Section 4.1(b), in connection with investigating or defending any such loss, claim, damage, liability, action or expense as a result of a Holder's untrue statement or omission or violation; provided, however, that the indemnification contained in this Section 4.1(b) shall not apply to amounts paid in settlement of any such loss, claim, damage, liability, action or expense if such settlement is effected without the consent of such Holder (which consent shall not be unreasonably withheld, conditioned or delayed). Notwithstanding the foregoing, the amount any Holder will be obligated to pay

pursuant to this Section 4.1(b) and Section 4.2 will be limited to an amount equal to the gross proceeds actually received by such Holder for the sale of the Registrable Securities pursuant to the Registration Statement which gives rise to such obligation to indemnify and/or contribute (net of all expenses paid by such Holder in connection with any claim relating to this Section 4.1(b) and Section 4.2 and the aggregate amount of any damages which such Holder has otherwise been required to pay in respect of such loss, liability, claim, damage, or expense or any substantially similar loss, liability, claim, damage, or expense arising from the sale of such Registrable Securities). Such indemnity shall remain in full force and effect regardless of any investigation made by or on behalf of any such Company Indemnitee, and shall survive the transfer of such securities by such Holder, and any termination of this Agreement.

(c) Promptly after receipt by a party to this Agreement entitled to indemnity hereunder (an "**Indemnified Party**") under this Section 4.1 of notice of the commencement of any action (including any governmental action), such Indemnified Party will, if a claim in respect thereof is to be made against any party to this Agreement from whom indemnification may be sought under this Section 4.1 (an "**Indemnifying Party**"), deliver to the Indemnifying Party a written notice of the commencement thereof and the Indemnifying Party shall have the right to participate in, and, to the extent the Indemnifying Party so desires, jointly with any other Indemnifying Party similarly noticed, to assume the defense thereof with counsel reasonably satisfactory to the Indemnifying Party; provided, however, that an Indemnified Party (together with all other Indemnified Parties which may be represented without conflict by one counsel) shall have the right to retain one separate counsel, with the reasonable fees and expenses of such counsel to be paid by the Indemnifying Party, if (i) the Indemnifying Party shall have failed to assume the defense of such claim within seven (7) days after receipt of notice of the claim and to employ counsel reasonably satisfactory to such Indemnified Party, as the case may be; or (ii) in the reasonable opinion of counsel retained by the Indemnified Party, representation of such Indemnified Party by such counsel would be inappropriate due to actual or potential differing interests (including the availability of differing legal defenses) between such Indemnified Party and any other party represented by such counsel in such proceeding. It is understood that the Indemnifying Party shall not, in connection with any proceeding in the same jurisdiction, be liable for fees or expenses of more than one separate counsel at any time for all such Indemnified Parties. The Indemnified Party shall cooperate fully with the Indemnifying Party in connection with any negotiation or defense of any such action or claim by the Indemnifying Party and shall furnish to the Indemnifying Party all information reasonably available to the Indemnified Party which relates to such action or claim. The Indemnifying Party shall keep the Indemnified Party reasonably apprised of the status of the defense or any settlement negotiations with respect thereto. No Indemnifying Party will, except with the consent of the Indemnified Party, consent to entry of any judgment or enter into any settlement that does not include as an unconditional term thereof the giving by the claimant or plaintiff to such Indemnified Party of a release from all liability in respect of such action or claim. No Indemnifying Party shall be liable for any settlement of any action, claim or proceeding effected without its prior written consent; provided, however, that the Indemnifying Party shall not unreasonably withhold, delay or condition its consent. The failure to deliver written notice to the Indemnifying Party within a reasonable time of the commencement of any such action shall not relieve such Indemnifying Party of any liability to the Indemnified Party under this Section 4.1, except to the extent such failure to give

notice has a material adverse effect on the ability of the Indemnifying Party to defend such action.

Section 4.2 Contribution. If the indemnification provided for in Section 4.1 is held by a court of competent jurisdiction to be unavailable to an Indemnified Party with respect to any loss, liability, claim, damage, or expense referred to therein, then the Indemnifying Party, in lieu of indemnifying such Indemnified Party hereunder, shall contribute to the amount paid or payable by such Indemnified Party as a result of such loss, liability, claim, damage, or expense in such proportion as is appropriate to reflect the relative fault of the Indemnifying Party on the one hand and of the Indemnified Party on the other in connection with the statements or omissions that resulted in such loss, liability, claim, damage, or expense as well as any other relevant equitable considerations. The relative fault of the Indemnifying Party and of the Indemnified Party shall be determined by reference to, among other things, whether the untrue or alleged untrue statement of a material fact or the omission to state a material fact relates to information supplied by the Indemnifying Party or by the Indemnified Party and the parties' relative intent, knowledge, access to information, and opportunity to correct or prevent such statement or omission. Notwithstanding the foregoing, the amount any Holder will be obligated to severally and not jointly contribute pursuant to this Section 4.2, together with Holder's liability under Section 4.1(b), will be limited to an amount equal to the gross proceeds received by a Holder for the sale of the Registrable Securities pursuant to the Registration Statement which gives rise to such obligation to contribute and/or indemnify (net of all expenses paid by such Holder in connection with any claim relating to Section 4.1(b) and this Section 4.2 and the aggregate amount of any damages which such Holder has otherwise been required to pay in respect of such loss, liability, claim, damage, or expense or any substantially similar loss, liability, claim, damage, or expense arising from the sale of such Registrable Securities). No person guilty of fraudulent misrepresentation (within the meaning of Section 11(f) of the Securities Act) will be entitled to contribution hereunder from any person who was not guilty of such fraudulent misrepresentation.

ARTICLE V
GENERAL PROVISIONS

Section 5.1 Entire Agreement. This Agreement (including Exhibit A hereto) constitutes the entire understanding and agreement between the parties as to the matters covered herein and supersedes and replaces any prior understanding, agreement or statement of intent, in each case, written or oral, of any and every nature with respect thereto.

Section 5.2 Notices. All notices, waivers, consents and other communications to any party hereunder shall be in writing and shall be deemed given (i) when personally delivered, (ii) when receipt is electronically confirmed, if sent by email of a .pdf document, (iii) one (1) Business Day after deposit with a nationally recognized overnight courier, specifying next day delivery, with proof of receipt or (iv) three (3) Business Days after being sent by registered or certified mail, return receipt requested and postage prepaid. The addresses, email addresses and facsimile numbers for such notices and communications are those set forth on the signature

pages hereof, or such other address, email address or facsimile numbers as may be designated in writing hereafter, in the same manner, by any such person.

Section 5.3 Counterparts. This Agreement may be executed in several counterparts, each of which shall be deemed an original copy of this Agreement and all of which, when taken together, shall constitute one instrument. The exchange of copies of this Agreement and manually executed signature pages by transmission by email of a .pdf of a handwritten original signature or signatures to the other parties hereto shall constitute effective execution and delivery of this Agreement and may be used in lieu of the original Agreement for all purposes. The signature of a party hereto transmitted by electronic means shall be deemed to be an original signature for any purpose.

Section 5.4 Amendment; Waiver. This Agreement may be amended or modified, and any provision hereof may be waived, in whole or in part, at any time pursuant to an agreement in writing executed by the Company and Holders holding a majority of the Registrable Securities at such time. Any failure by any party at any time to enforce any of the provisions of this Agreement shall not be construed a waiver of such provision or any other provisions hereof.

Section 5.5 Severability. If a court of competent jurisdiction finds that any term or provision of this Agreement is invalid, illegal or unenforceable under any Law or public policy, the remaining provisions of this Agreement shall remain in full force and effect if the economic and legal substance of this Agreement and the Transactions shall not be affected in any manner materially adverse to any party hereto. Any such term or provision found to be illegal, invalid or unenforceable only in part or in degree shall remain in full force and effect to the extent not invalid, illegal or unenforceable. Upon the determination that any term or provision is invalid, illegal or unenforceable, the parties hereto intend that such provision shall be construed by modifying or limiting it so as to be valid and enforceable to the maximum extent possible under applicable Law and compatible with the consummation of the Transactions as originally intended.

Section 5.6. **Governing Law; Venue**. This Agreement and all claims or causes of action (whether sounding in contract or tort) arising under or related to this Agreement shall be governed by, and construed in accordance with, the Laws of the State of Delaware, without regard to any rule or principle that might refer the governance or construction of this Agreement to the Laws of another jurisdiction. In any action or proceeding between any of the parties hereto arising under or related to this Agreement, each of the parties hereto (i) knowingly, voluntarily, irrevocably and unconditionally consents and submits to the exclusive jurisdiction and venue of the state or federal courts located in the City and County of San Francisco, California, and each of the Parties hereby irrevocably submits to the exclusive jurisdiction of the aforesaid courts, (ii) agrees that all claims in respect of any such action or proceeding shall be heard and determined exclusively in accordance with clause (i) of this Section 5.6, (iii) waives any objection to the laying of venue of any such action or proceeding in such courts, including any objection that any such action or proceeding has been brought in an inconvenient forum or that the court does not have jurisdiction over any party hereto and (iv) agrees that service of process upon such party in any such action or proceeding shall be effective if such process is given as a notice in accordance

with Section 5.2. The parties hereto agree that any party hereto may commence a proceeding in a court other than the above-named courts solely for the purpose of enforcing an order or judgment issued by one of the above-named courts.

Section 5.7 Specific Performance. Each party acknowledges and agrees that the other parties hereto would be irreparably harmed and would not have any adequate remedy at law in the event that any of the provisions of this Agreement were not performed by such first party in accordance with their specific terms or were otherwise breached by such first party. Accordingly, each party agrees that the other parties hereto shall be entitled to an injunction or injunctions to prevent breaches of this Agreement and to enforce specifically the terms and provisions of this Agreement, this being in addition to any other remedy to which such parties are entitled at law or in equity.

(Next Page is Signature Page)

IN WITNESS WHEREOF, each of the parties has executed this Agreement as of the date first written above.

COMPANY:

INVITAE CORPORATION

By: /s/ Sean E. George
Name: Sean E. George, Ph.D.
Title: President and Chief Executive Officer

Address for Notice:

1400 16th Street
San Francisco, California 94103
Attn: General Counsel
Facsimile No.: (415) 276-4164

IN WITNESS WHEREOF, each of the undersigned has executed this Agreement as of the date first written above.

HOLDER:

By: /s/ Marc Grodman
Name: Marc Grodman

IN WITNESS WHEREOF, each of the undersigned has executed this Agreement as of the date first written above.

HOLDER:

By: /s/ Pamela Grodman
Name: Pamela Grodman
Title:

IN WITNESS WHEREOF, each of the undersigned has executed this Agreement as of the date first written above.

HOLDER:

Name: Trust of Marc D. Grodman 2010 GRAT

By: /s/ Pamela Grodman
Name: Pamela Grodman
Title: Trustee

IN WITNESS WHEREOF, each of the undersigned has executed this Agreement as of the date first written above.

HOLDER:

Name: Trust of Marc D. Grodman 2010 GRAT

By: /s/ Joseph P. Benincasa
Name: Joseph P. Benincasa
Title: Trustee

IN WITNESS WHEREOF, each of the undersigned has executed this Agreement as of the date first written above.

HOLDER:

By: /s/ Robert D. Dober
Name: Robert D. Dober
Title:

IN WITNESS WHEREOF, each of the undersigned has executed this Agreement as of the date first written above.

HOLDER:

Name: Harpreet Gill

By: /s/ Harpreet Gill
Name: Harpreet Gill
Title:

IN WITNESS WHEREOF, each of the undersigned has executed this Agreement as of the date first written above.

HOLDER:

By: /s/ Judy Hochsztein
Name: Judy Hochsztein
Title:

IN WITNESS WHEREOF, each of the undersigned has executed this Agreement as of the date first written above.

HOLDER:

By: /s/ Jianhua Zhao
Name: Jianhua Zhao
Title:

IN WITNESS WHEREOF, each of the undersigned has executed this Agreement as of the date first written above.

HOLDER:

By: /s/ Sandra Matesic-Smith
Name: Sandra Matesic-Smith
Title:

IN WITNESS WHEREOF, each of the undersigned has executed this Agreement as of the date first written above.

HOLDER:

By: /s/ Sandy Close
Name: Sandy Close
Title:

IN WITNESS WHEREOF, each of the undersigned has executed this Agreement as of the date first written above.

HOLDER:

By: /s/ Trevor Hawkins
Name: Trevor Hawkins
Title:

IN WITNESS WHEREOF, each of the undersigned has executed this Agreement as of the date first written above.

HOLDER:

By: /s/ William O'Callaghan
Name: William O'Callaghan
Title:

INVITAE CORPORATION

2015 STOCK INCENTIVE PLAN

(As Amended and Restated by the Board of Directors on March 26, 2021)

SECTION 1. ESTABLISHMENT AND PURPOSE.

The Plan was adopted by the Board of Directors on January 8, 2015 and became effective immediately prior to the closing of the initial offering of Stock to the public pursuant to a registration statement filed by the Company with the Securities and Exchange Commission (the "Effective Date"), was amended and restated on June 11, 2019, and was further amended and restated on March 6, 2020, June 12, 2020, December 7, 2020 and March 26, 2021. The purpose of the Plan is to promote the long-term success of the Company and the creation of stockholder value by (a) encouraging Employees, Outside Directors and Consultants to focus on critical long-range objectives, (b) encouraging the attraction and retention of Employees, Outside Directors and Consultants with exceptional qualifications and (c) linking Employees, Outside Directors and Consultants directly to stockholder interests through increased stock ownership. The Plan seeks to achieve this purpose by providing for Awards in the form of restricted shares, stock units, options (which may constitute incentive stock options or nonstatutory stock options), stock appreciation rights or cash-based awards.

SECTION 2. DEFINITIONS.

(a) "Affiliate"

shall mean any entity other than a Subsidiary, if the Company and/or one or more Subsidiaries own not less than 50% of such entity.

(b) "Award"

shall mean any award of an Option, a SAR, a Restricted Share or a Stock Unit or a Cash-Based Award under the Plan.

(c) "Award Agreement"

shall mean the agreement between the Company and the recipient of an Award which contains the terms, conditions and restrictions pertaining to such Award.

(d) "Board of Directors" or "Board"

shall mean the Board of Directors of the Company, as constituted from time to time.

(e) *"Cash-Based Award"*

shall mean an Award that entitles the Participant to receive a cash-denominated payment.

(f) *"Change in Control"*

shall mean the occurrence of any of the following events:

(i) A change in the composition of the Board of Directors occurs, as a result of which fewer than one-half of the incumbent directors are directors who either:

(1) Had been directors of the Company on the "look-back date" (as defined below) (the "original directors"); or

(2) Were elected, or nominated for election, to the Board of Directors with the affirmative votes of at least a majority of the aggregate of the original directors who were still in office at the time of the election or nomination and the directors whose election or nomination was previously so approved (the "continuing directors");

provided, however, that for this purpose, the "original directors" and "continuing directors" shall not include any individual whose initial assumption of office occurred as a result of an actual or threatened election contest with respect to the election or removal of directors or other actual or threatened solicitation of proxies or consents, by or on behalf of a person other than the Board; or

(ii) Any "person" (as defined below) who by the acquisition or aggregation of securities, is or becomes the "beneficial owner" (as defined in Rule 13d-3 under the Exchange Act), directly or indirectly, of securities of the Company representing 50% or more of the combined voting power of the Company's then outstanding securities ordinarily (and apart from rights accruing under special circumstances) having the right to vote at elections of directors (the "Base Capital Stock"); except that any change in the relative beneficial ownership of the Company's securities by any person resulting solely from a reduction in the aggregate number of outstanding shares of Base Capital Stock, and any decrease thereafter in such person's ownership of securities, shall be disregarded until such person increases in any manner, directly or indirectly, such person's beneficial ownership of any securities of the Company; or

(iii) The consummation of a merger or consolidation of the Company or a Subsidiary of the Company with or into another entity or any other corporate reorganization, if persons who were not stockholders of the

Company immediately prior to such merger, consolidation or other reorganization own immediately after such merger, consolidation or other reorganization 50% or more of the voting power of the outstanding securities of each of (A) the Company (or its successor) and (B) any direct or indirect parent corporation of the Company (or its successor); or

(iv) The sale, transfer or other disposition of all or substantially all of the Company's assets.

For purposes of subsection (e)(i) above, the term "look-back" date shall mean the later of (1) the Effective Date or (2) the date 24 months prior to the date of the event that may constitute a Change in Control.

For purposes of subsection (e)(ii)) above, the term "person" shall have the same meaning as when used in Sections 13(d) and 14(d) of the Exchange Act but shall exclude (1) a trustee or other fiduciary holding securities under an employee benefit plan maintained by the Company or a Parent or Subsidiary and (2) a corporation owned directly or indirectly by the stockholders of the Company in substantially the same proportions as their ownership of the Stock.

Any other provision of this Section 2(e) notwithstanding, a transaction shall not constitute a Change in Control if its sole purpose is to change the state of the Company's incorporation or to create a holding company that will be owned in substantially the same proportions by the persons who held the Company's securities immediately before such transaction, and a Change in Control shall not be deemed to occur if the Company files a registration statement with the United States Securities and Exchange Commission for the initial or secondary public offering of securities or debt of the Company to the public.

(g) "Code"

shall mean the Internal Revenue Code of 1986, as amended.

(h) "Committee"

shall mean the Compensation Committee as designated by the Board of Directors, which is authorized to administer the Plan, as described in Section 3 hereof.

(i) "Company"

shall mean Invitae Corporation, a Delaware corporation.

(j) "Consultant"

shall mean a consultant or advisor who provides bona fide services to the Company, a Parent, a Subsidiary or an Affiliate as an independent contractor (not including service as a member of the Board of Directors) or a member of the board of directors of a Parent or a Subsidiary, in each case who is not an Employee.

(k) "Employee"

shall mean any individual who is a common-law employee of the Company, a Parent, a Subsidiary or an Affiliate.

(l) "Exchange Act"

shall mean the Securities Exchange Act of 1934, as amended.

(m) "Exercise Price"

shall mean, in the case of an Option, the amount for which one Share may be purchased upon exercise of such Option, as specified in the applicable Stock Option Agreement. "Exercise Price," in the case of a SAR, shall mean an amount, as specified in the applicable SAR Agreement, which is subtracted from the Fair Market Value of one Share in determining the amount payable upon exercise of such SAR.

(n) "Fair Market Value"

with respect to a Share, shall mean the market price of one Share, determined by the Committee as follows:

(i) If the Stock was traded over-the-counter on the date in question, then the Fair Market Value shall be equal to the last transaction price quoted for such date by the OTC Bulletin Board or, if not so quoted, shall be equal to the mean between the last reported representative bid and asked prices quoted for such date by the principal automated inter-dealer quotation system on which the Stock is quoted or, if the Stock is not quoted on any such system, by the Pink Quote system;

(ii) If the Stock was traded on any established stock exchange (such as the New York Stock Exchange, The Nasdaq Global Market or The Nasdaq Global Select Market) or national market system on the date in question, then the Fair Market Value shall be equal to the closing price reported for such date by the applicable exchange or system; and

(iii) If none of the foregoing provisions is applicable, then the Fair Market Value shall be determined by the Committee in good faith on such basis as it deems appropriate.

In all cases, the determination of Fair Market Value by the Committee shall be conclusive and binding on all persons.

(o) "ISO"

shall mean an employee incentive stock option described in Section 422 of the Code.

(p) *"Nonstatutory Option" or "NSO"*

shall mean an employee stock option that is not an ISO.

(q) *"Option"*

shall mean an ISO or Nonstatutory Option granted under the Plan and entitling the holder to purchase Shares.

(r) *"Outside Director"*

shall mean a member of the Board of Directors who is not a common-law employee of, or paid consultant to, the Company, a Parent or a Subsidiary.

(s) *"Parent"*

shall mean any corporation (other than the Company) in an unbroken chain of corporations ending with the Company, if each of the corporations other than the Company owns stock possessing 50% or more of the total combined voting power of all classes of stock in one of the other corporations in such chain. A corporation that attains the status of a Parent on a date after the adoption of the Plan shall be a Parent commencing as of such date.

(t) *"Participant"*

shall mean a person who holds an Award.

(u) *"Performance Based Award"*

shall mean any Restricted Share Award, Stock Unit Award or Cash-Based Award granted to a Participant pursuant to the terms set forth in Section 20.

(v) *"Plan"*

shall mean this 2015 Stock Incentive Plan of Invitae Corporation, as amended from time to time.

(w) *"Purchase Price"*

shall mean the consideration for which one Share may be acquired under the Plan (other than upon exercise of an Option), as specified by the Committee.

(x) *"Restricted Share"*

shall mean a Share awarded under the Plan.

(y) *"SAR"*

shall mean a stock appreciation right granted under the Plan.

(z) "Service"

shall mean service as an Employee, Consultant or Outside Director, subject to such further limitations as may be set forth in the Plan or the applicable Award Agreement. Service does not terminate when an Employee goes on a bona fide leave of absence, that was approved by the Company in writing, if the terms of the leave provide for continued Service crediting, or when continued Service crediting is required by applicable law. However, for purposes of determining whether an Option is entitled to ISO status, an Employee's employment will be treated as terminating three months after such Employee went on leave, unless such Employee's right to return to active work is guaranteed by law or by a contract. Service terminates in any event when the approved leave ends, unless such Employee immediately returns to active work. The Company determines which leaves of absence count toward Service, and when Service terminates for all purposes under the Plan.

(aa) "Share"

shall mean one share of Stock, as adjusted in accordance with Section 12 (if applicable).

(ab) "Stock"

shall mean the Common Stock of the Company.

(ac) "Stock Unit"

shall mean a bookkeeping entry representing the Company's obligation to deliver one Share (or distribute cash) on a future date in accordance with the provisions of a Stock Unit Award Agreement.

(ad) "Subsidiary"

shall mean any corporation, if the Company and/or one or more other Subsidiaries own not less than 50% of the total combined voting power of all classes of outstanding stock of such corporation. A corporation that attains the status of a Subsidiary on a date after the adoption of the Plan shall be considered a Subsidiary commencing as of such date.

(ae) "Total and Permanent Disability"

shall mean any permanent and total disability as defined by Section 22(e)(3) of the Code.

SECTION 3. ADMINISTRATION.

(a) Committee Composition

.The Plan shall be administered by a Committee appointed by the Board, or by the Board acting as the Committee. The Committee shall consist of two or more directors of the

Company. In addition, to the extent required by the Board, the composition of the Committee shall satisfy (i) such requirements as the Securities and Exchange Commission may establish for administrators acting under plans intended to qualify for exemption under Rule 16b-3 (or its successor) under the Exchange Act; and (ii) such requirements as the Internal Revenue Service may establish for outside directors acting under plans intended to qualify for exemption under Section 162(m)(4)(C) of the Code.

(b) Committee for Non-Officer Grants

The Board may also appoint one or more separate committees of the Board, each composed of one or more directors of the Company who need not satisfy the requirements of Section 3(a), who may administer the Plan with respect to Employees who are not considered officers or directors of the Company under Section 16 of the Exchange Act, may grant Awards under the Plan to such Employees and may determine all terms of such grants. Within the limitations of the preceding sentence, any reference in the Plan to the Committee shall include such committee or committees appointed pursuant to the preceding sentence. To the extent permitted by applicable laws, the Board of Directors may also authorize one or more officers of the Company to designate Employees, other than officers under Section 16 of the Exchange Act, to receive Awards and/or to determine the number of such Awards to be received by such persons; provided, however, that the Board of Directors shall specify the total number of Awards that such officers may so award.

(c) Committee Procedures

The Board of Directors shall designate one of the members of the Committee as chairman. The Committee may hold meetings at such times and places as it shall determine. The acts of a majority of the Committee members present at meetings at which a quorum exists, or acts reduced to or approved in writing (including via email) by all Committee members, shall be valid acts of the Committee.

(d) Committee Responsibilities

Subject to the provisions of the Plan, the Committee shall have full authority and discretion to take the following actions:

(i) To interpret the Plan and to apply its provisions;

(ii) To adopt, amend or rescind rules, procedures and forms relating to the Plan;

(iii) To adopt, amend or terminate sub-plans established for the purpose of satisfying applicable foreign laws including qualifying for preferred tax treatment under applicable foreign tax laws;

(iv) To authorize any person to execute, on behalf of the Company, any instrument required to carry out the purposes of the Plan;

(v) To determine when Awards are to be granted under the Plan;

(vi) To select the Participants to whom Awards are to be granted;

(vii) To determine the type of Award and number of Shares or amount of cash to be made subject to each Award;

(viii) To prescribe the terms and conditions of each Award, including (without limitation) the Exercise Price and Purchase Price, and the vesting or duration of the Award (including accelerating the vesting of Awards, either at the time of the Award or thereafter, without the consent of the Participant), to determine whether an Option is to be classified as an ISO or as a Nonstatutory Option, and to specify the provisions of the agreement relating to such Award;

(ix) To amend any outstanding Award Agreement, subject to applicable legal restrictions and to the consent of the Participant if the Participant's rights or obligations would be materially impaired;

(x) To prescribe the consideration for the grant of each Award or other right under the Plan and to determine the sufficiency of such consideration;

(xi) To determine the disposition of each Award or other right under the Plan in the event of a Participant's divorce or dissolution of marriage;

(xii) To determine whether Awards under the Plan will be granted in replacement of other grants under an incentive or other compensation plan of an acquired business;

(xiii) To correct any defect, supply any omission, or reconcile any inconsistency in the Plan or any Award Agreement;

(xiv) To establish or verify the extent of satisfaction of any performance goals or other conditions applicable to the grant, issuance, exercisability, vesting and/or ability to retain any Award; and

(xv) To take any other actions deemed necessary or advisable for the administration of the Plan.

Subject to the requirements of applicable law, the Committee may designate persons other than members of the Committee to carry out its responsibilities and may prescribe such conditions and limitations as it may deem appropriate, except that the Committee may not delegate its authority with regard to the selection for participation of or the granting of Awards under the Plan to persons subject to Section 16 of the Exchange Act. All decisions, interpretations and other actions of the Committee shall be final and binding on all Participants and all persons deriving their rights from a Participant. No member of the Committee shall be liable for any

action that he has taken or has failed to take in good faith with respect to the Plan or any Award under the Plan.

SECTION 4. ELIGIBILITY.

(a) General Rule

Only Employees, Consultants and Outside Directors shall be eligible for the grant of Awards. Only common-law employees of the Company, a Parent or a Subsidiary shall be eligible for the grant of ISOs.

(b) Ten-Percent Stockholders

An Employee who owns more than 10% of the total combined voting power of all classes of outstanding stock of the Company, a Parent or Subsidiary shall not be eligible for the grant of an ISO unless such grant satisfies the requirements of Section 422(c)(5) of the Code.

(c) Attribution Rules

For purposes of Section 4(c) above, in determining stock ownership, an Employee shall be deemed to own the stock owned, directly or indirectly, by or for such Employee's brothers, sisters, spouse, ancestors and lineal descendants. Stock owned, directly or indirectly, by or for a corporation, partnership, estate or trust shall be deemed to be owned proportionately by or for its stockholders, partners or beneficiaries.

(d) Outstanding Stock

For purposes of Section 4(c) above, "outstanding stock" shall include all stock actually issued and outstanding immediately after the grant. "Outstanding stock" shall not include shares authorized for issuance under outstanding options held by the Employee or by any other person.

SECTION 5. STOCK SUBJECT TO PLAN.

(a) Basic Limitation

Shares offered under the Plan shall be authorized but unissued Shares or treasury Shares. The aggregate number of Shares authorized for issuance as Awards under the Plan (other than Inducement Awards as set forth in Section 15) shall not exceed the sum of (x) 4,250,000 Shares, plus (y) the sum of the number of Shares subject to outstanding awards under the Company's 2010 Stock Plan (the "*Predecessor Plan*") on the Effective Date that are subsequently forfeited or terminated for any reason before being exercised or settled, plus the number of Shares subject to vesting restrictions under the Predecessor Plan on the Effective Date that are subsequently forfeited, plus the number of reserved Shares not issued or subject to outstanding grants under the Predecessor Plan on the Effective Date, plus (z) an annual increase on the first day of each fiscal year, for a period of not more than ten years, beginning on January 1, 2016, and ending on (and including) January 1, 2025, in an amount equal to the lesser of (i)

four percent (4%) of the outstanding Shares on the last day of the immediately preceding fiscal or (ii) if the Board acts prior to the first day of the fiscal year, such lesser amount (including zero) that the Board determines for purposes of the annual increase for that fiscal year. Notwithstanding the foregoing: (A) the number of Shares that may be delivered in the aggregate pursuant to the exercise of ISOs granted under the Plan shall not exceed 16,833,333 Shares plus, to the extent allowable under Section 422 of the Code and the Treasury Regulations promulgated thereunder, any Shares that become available for issuance under the Plan pursuant to Section 5(c); and (B) an additional 543,872 Shares are authorized for issuance as Awards under the Plan as a result of the Company's assumption of the 2015 ArcherDX, Inc. Stock Incentive Plan, provided such Awards may not be issued (I) to persons who were Employees, Consultants or Outside Directors of the Company or its Subsidiaries prior to October 2, 2020 (*i.e.*, the date of the Company's acquisition of ArcherDX, Inc.) or (II) following September 2, 2025 (*i.e.*, the end of the original term of the 2015 ArcherDX, Inc. Stock Incentive Plan). The limitations of this Section 5(a) shall be subject to adjustment pursuant to Section 12. The number of Shares that are subject to Awards outstanding at any time under the Plan shall not exceed the number of Shares which then remain available for issuance under the Plan. The Company shall at all times reserve and keep available sufficient Shares to satisfy the requirements of the Plan.

(b) Award Limitation

No Participant eligible for an Award may receive Options or SARs under the Plan, excluding Inducement Awards, in any calendar year that relate to an aggregate of more than 2,000,000 Shares, and no more than two times this amount in the first year of employment. In applying the foregoing limitation with respect to a Participant, if any Option or SAR is canceled, the canceled Option or SAR shall continue to count against the maximum number of Shares with respect to which Options and SARs may be granted to the Participant. For this purpose, the repricing of an Option or SAR shall be treated as the cancellation of the existing Option or SAR and the grant of a new Option or SAR.

(c) Additional Shares

If Restricted Shares or Shares issued upon the exercise of Options are forfeited, then such Shares shall again become available for Awards under the Plan. If Stock Units, Options or SARs are forfeited or terminate for any reason before being exercised or settled, or an Award is settled in cash without the delivery of Shares to the holder, then any Shares subject to the Award shall again become available for Awards under the Plan. Only the number of Shares (if any) actually issued in settlement of Awards (and not forfeited) shall reduce the number available in Section 5(a) and the balance shall again become available for Awards under the Plan. Any Shares withheld to satisfy the grant or exercise price or tax withholding obligation pursuant to any Award shall again become available for Awards under the Plan. Notwithstanding the foregoing provisions of this Section 5(c), Shares that have actually been issued shall not again become available for Awards under the Plan, except for Shares that are forfeited and do not become vested.

(d) Substitution and Assumption of Awards

The Committee may make Awards under the Plan by assumption, substitution or replacement of stock options, stock appreciation rights, stock units or similar awards granted by another entity (including a Parent or Subsidiary), if such assumption, substitution or replacement is in connection with an asset acquisition, stock acquisition, merger, consolidation or similar transaction involving the Company (and/or its Parent or Subsidiary) and such other entity (and/or its affiliate). The terms of such assumed, substituted or replaced Awards shall be as the Committee, in its discretion, determines is appropriate. Any such substitute or assumed Awards shall not count against the Share limitation set forth in Section 5(a).

SECTION 6. RESTRICTED SHARES.

(a) Restricted Share Award Agreement

Each grant of Restricted Shares under the Plan shall be evidenced by a Restricted Share Award Agreement between the Participant and the Company. Such Restricted Shares shall be subject to all applicable terms of the Plan and may be subject to any other terms that are not inconsistent with the Plan. The provisions of the various Restricted Share Award Agreements entered into under the Plan need not be identical.

(b) Payment for Awards

Restricted Shares may be sold or awarded under the Plan for such consideration as the Committee may determine, including (without limitation) cash, cash equivalents, full-recourse promissory notes, past services and future services.

(c) Vesting

Each Award of Restricted Shares may or may not be subject to vesting. Vesting shall occur, in full or in installments, upon satisfaction of the conditions specified in the Restricted Share Award Agreement. A Restricted Share Award Agreement may provide for accelerated vesting in the event of the Participant's death, disability or retirement or other events. The Committee may determine, at the time of granting Restricted Shares or thereafter, that all or part of such Restricted Shares shall become vested in the event that a Change in Control occurs with respect to the Company.

(d) Voting and Dividend Rights

The holders of Restricted Shares awarded under the Plan shall have the same voting, dividend and other rights as the Company's other stockholders. A Restricted Share Award Agreement, however, may require that the holders of Restricted Shares invest any cash dividends received in additional Restricted Shares. Such additional Restricted Shares shall be subject to the same conditions and restrictions as the Award with respect to which the dividends were paid.

(e) Restrictions on Transfer of Shares

Restricted Shares shall be subject to such rights of repurchase, rights of first refusal or other restrictions as the Committee may determine. Such restrictions shall be set forth in the applicable Restricted Share Award Agreement and shall apply in addition to any general restrictions that may apply to all holders of Shares.

SECTION 7. TERMS AND CONDITIONS OF OPTIONS.

(a) Stock Option Award Agreement

Each grant of an Option under the Plan shall be evidenced by a Stock Option Award Agreement between the Participant and the Company. Such Option shall be subject to all applicable terms and conditions of the Plan and may be subject to any other terms and conditions which are not inconsistent with the Plan and which the Committee deems appropriate for inclusion in a Stock Option Award Agreement. The Stock Option Award Agreement shall specify whether the Option is an ISO or an NSO. The provisions of the various Stock Option Award Agreements entered into under the Plan need not be identical.

(b) Number of Shares

Each Stock Option Award Agreement shall specify the number of Shares that are subject to the Option and shall provide for the adjustment of such number in accordance with Section 12.

(c) Exercise Price

Each Stock Option Award Agreement shall specify the Exercise Price. The Exercise Price of an ISO shall not be less than 100% of the Fair Market Value of a Share on the date of grant, except as otherwise provided in 4(c), and the Exercise Price of an NSO shall not be less 100% of the Fair Market Value of a Share on the date of grant. Notwithstanding the foregoing, Options may be granted with an Exercise Price of less than 100% of the Fair Market Value per Share on the date of grant pursuant to a transaction described in, and in a manner consistent with, Section 424(a) of the Code. Subject to the foregoing in this Section 7(c), the Exercise Price under any Option shall be determined by the Committee in its sole discretion. The Exercise Price shall be payable in one of the forms described in Section 8.

(d) Withholding Taxes

As a condition to the exercise of an Option, the Participant shall make such arrangements as the Committee may require for the satisfaction of any federal, state, local or foreign withholding tax obligations that may arise in connection with such exercise. The Participant shall also make such arrangements as the Committee may require for the satisfaction of any federal, state, local or foreign withholding tax obligations that may arise in connection with the disposition of Shares acquired by exercising an Option.

(e) Exercisability and Term

Each Stock Option Award Agreement shall specify the date when all or any installment of the Option is to become exercisable. The Stock Option Award Agreement shall also specify the term of the Option; provided that the term of an ISO shall in no event exceed 10 years from the date of grant (five years for ISOs granted to Employees described in Section 4(c)). A Stock Option Award Agreement may provide for accelerated exercisability in the event of the Participant's death, disability, or retirement or other events and may provide for expiration prior to the end of its term in the event of the termination of the Participant's Service. Options may be awarded in combination with SARs, and such an Award may provide that the Options will not be exercisable unless the related SARs are forfeited. Subject to the foregoing in this Section 7(e), the Committee at its sole discretion shall determine when all or any installment of an Option is to become exercisable and when an Option is to expire.

(f) Exercise of Options

Each Stock Option Award Agreement shall set forth the extent to which the Participant shall have the right to exercise the Option following termination of the Participant's Service with the Company and its Subsidiaries, and the right to exercise the Option of any executors or administrators of the Participant's estate or any person who has acquired such Option(s) directly from the Participant by bequest or inheritance. Such provisions shall be determined in the sole discretion of the Committee, need not be uniform among all Options issued pursuant to the Plan, and may reflect distinctions based on the reasons for termination of Service.

(g) Effect of Change in Control

The Committee may determine, at the time of granting an Option or thereafter, that such Option shall become exercisable as to all or part of the Shares subject to such Option in the event that a Change in Control occurs with respect to the Company.

(h) No Rights as a Stockholder

A Participant shall have no rights as a stockholder with respect to any Shares covered by his Option until the date of the issuance of a stock certificate for such Shares. No adjustments shall be made, except as provided in Section 12.

(i) Modification, Extension and Renewal of Options

Within the limitations of the Plan, the Committee may modify, extend or renew outstanding options or may accept the cancellation of outstanding options (to the extent not previously exercised), whether or not granted hereunder, in return for the grant of new Options for the same or a different number of Shares and at the same or a different Exercise Price, or in return for the grant of a different Award for the same or a different number of Shares, without stockholder approval. The foregoing notwithstanding, no modification of an Option shall, without the consent of the Participant, materially impair his or her rights or obligations under such Option.

(j) Restrictions on Transfer of Shares

Any Shares issued upon exercise of an Option shall be subject to such special forfeiture conditions, rights of repurchase, rights of first refusal and other transfer restrictions as the Committee may determine. Such restrictions shall be set forth in the applicable Stock Option Award Agreement and shall apply in addition to any general restrictions that may apply to all holders of Shares.

(k) Buyout Provisions

The Committee may at any time (a) offer to buy out for a payment in cash or cash equivalents an Option previously granted or (b) authorize a Participant to elect to cash out an Option previously granted, in either case at such time and based upon such terms and conditions as the Committee shall establish.

SECTION 8. PAYMENT FOR SHARES.

(a) General Rule

The entire Exercise Price or Purchase Price of Shares issued under the Plan shall be payable in lawful money of the United States of America at the time when such Shares are purchased, except as provided in Section 8(b) through Section 8(h) below.

(b) Surrender of Stock

To the extent that a Stock Option Award Agreement so provides, payment may be made all or in part by surrendering, or attesting to the ownership of, Shares which have already been owned by the Participant or his representative. Such Shares shall be valued at their Fair Market Value on the date when the new Shares are purchased under the Plan. The Participant shall not surrender, or attest to the ownership of, Shares in payment of the Exercise Price if such action would cause the Company to recognize compensation expense (or additional compensation expense) with respect to the Option for financial reporting purposes.

(c) Services Rendered

At the discretion of the Committee, Shares may be awarded under the Plan in consideration of services rendered to the Company or a Subsidiary. If Shares are awarded without the payment of a Purchase Price in cash, the Committee shall make a determination (at the time of the Award) of the value of the services rendered by the Participant and the sufficiency of the consideration to meet the requirements of Section 6(b).

(d) Cashless Exercise

To the extent that a Stock Option Award Agreement so provides, payment may be made all or in part by delivery (on a form prescribed by the Committee) of an irrevocable direction to a securities broker to sell Shares and to deliver all or part of the sale proceeds to the Company in payment of the aggregate Exercise Price.

(e) Exercise/Pledge

To the extent that a Stock Option Award Agreement so provides, payment may be made all or in part by delivery (on a form prescribed by the Committee) of an irrevocable direction to a securities broker or lender to pledge Shares, as security for a loan, and to deliver all or part of the loan proceeds to the Company in payment of the aggregate Exercise Price.

(f) Net Exercise

To the extent that a Stock Option Award Agreement so provides, by a "net exercise" arrangement pursuant to which the number of Shares issuable upon exercise of the Option shall be reduced by the largest whole number of Shares having an aggregate Fair Market Value that does not exceed the aggregate exercise price (plus tax withholdings, if applicable) and any remaining balance of the aggregate exercise price (and/or applicable tax withholdings) not satisfied by such reduction in the number of whole Shares to be issued shall be paid by the Optionee in cash other form of payment permitted under the Stock Option Agreement.

(g) Promissory Note

To the extent that a Stock Option Award Agreement or Restricted Share Award Agreement so provides, payment may be made all or in part by delivering (on a form prescribed by the Company) a full-recourse promissory note.

(h) Other Forms of Payment

To the extent that a Stock Option Award Agreement or Restricted Share Award Agreement so provides, payment may be made in any other form that is consistent with applicable laws, regulations and rules.

(i) Limitations under Applicable Law

Notwithstanding anything herein or in a Stock Option Award Agreement or Restricted Share Award Agreement to the contrary, payment may not be made in any form that is unlawful, as determined by the Committee in its sole discretion.

SECTION 9. STOCK APPRECIATION RIGHTS.

(a) SAR Award Agreement

Each grant of a SAR under the Plan shall be evidenced by a SAR Award Agreement between the Participant and the Company. Such SAR shall be subject to all applicable terms of the Plan and may be subject to any other terms that are not inconsistent with the Plan. The provisions of the various SAR Award Agreements entered into under the Plan need not be identical.

(b) Number of Shares

Each SAR Award Agreement shall specify the number of Shares to which the SAR pertains and shall provide for the adjustment of such number in accordance with Section 12.

(c) Exercise Price

Each SAR Award Agreement shall specify the Exercise Price. The Exercise Price of a SAR shall not be less than 100% of the Fair Market Value of a Share on the date of grant. Notwithstanding the foregoing, SARs may be granted with an Exercise Price of less than 100% of the Fair Market Value per Share on the date of grant pursuant to a transaction described in, and in a manner consistent with, Section 424(a) of the Code. Subject to the foregoing in this Section 9(c), the Exercise Price under any SAR shall be determined by the Committee in its sole discretion.

(d) Exercisability and Term

Each SAR Award Agreement shall specify the date when all or any installment of the SAR is to become exercisable. The SAR Award Agreement shall also specify the term of the SAR. A SAR Award Agreement may provide for accelerated exercisability in the event of the Participant's death, disability or retirement or other events and may provide for expiration prior to the end of its term in the event of the termination of the Participant's service. SARs may be awarded in combination with Options, and such an Award may provide that the SARs will not be exercisable unless the related Options are forfeited. A SAR may be included in an ISO only at the time of grant but may be included in an NSO at the time of grant or thereafter. A SAR granted under the Plan may provide that it will be exercisable only in the event of a Change in Control.

(e) Effect of Change in Control

The Committee may determine, at the time of granting a SAR or thereafter, that such SAR shall become fully exercisable as to all Common Shares subject to such SAR in the event that a Change in Control occurs with respect to the Company.

(f) Exercise of SARs

Upon exercise of a SAR, the Participant (or any person having the right to exercise the SAR after his or her death) shall receive from the Company (a) Shares, (b) cash or (c) a combination of Shares and cash, as the Committee shall determine. The amount of cash and/or the Fair Market Value of Shares received upon exercise of SARs shall, in the aggregate, be equal to the amount by which the Fair Market Value (on the date of surrender) of the Shares subject to the SARs exceeds the Exercise Price.

(g) Modification or Assumption of SARs

Within the limitations of the Plan, the Committee may modify, extend or assume outstanding SARs or may accept the cancellation of outstanding SARs (whether granted by the

Company or by another issuer) in return for the grant of new SARs for the same or a different number of shares and at the same or a different exercise price, or in return for the grant of a different Award for the same or a different number of Shares, without stockholder approval. The foregoing notwithstanding, no modification of a SAR shall, without the consent of the holder, materially impair his or her rights or obligations under such SAR.

(h) Buyout Provisions

The Committee may at any time (a) offer to buy out for a payment in cash or cash equivalents a SAR previously granted, or (b) authorize a Participant to elect to cash out a SAR previously granted, in either case at such time and based upon such terms and conditions as the Committee shall establish.

SECTION 10.STOCK UNITS.

(a) Stock Unit Award Agreement

Each grant of Stock Units under the Plan shall be evidenced by a Stock Unit Award Agreement between the Participant and the Company. Such Stock Units shall be subject to all applicable terms of the Plan and may be subject to any other terms that are not inconsistent with the Plan. The provisions of the various Stock Unit Award Agreements entered into under the Plan need not be identical.

(b) Payment for Awards

To the extent that an Award is granted in the form of Stock Units, no cash consideration shall be required of the Award recipients.

(c) Vesting Conditions

Each Award of Stock Units may or may not be subject to vesting. Vesting shall occur, in full or in installments, upon satisfaction of the conditions specified in the Stock Unit Award Agreement. A Stock Unit Award Agreement may provide for accelerated vesting in the event of the Participant's death, disability or retirement or other events. The Committee may determine, at the time of granting Stock Units or thereafter, that all or part of such Stock Units shall become vested in the event that a Change in Control occurs with respect to the Company.

(d) Voting and Dividend Rights

The holders of Stock Units shall have no voting rights. Prior to settlement or forfeiture, any Stock Unit awarded under the Plan may, at the Committee's discretion, carry with it a right to dividend equivalents. Such right entitles the holder to be credited with an amount equal to all cash dividends paid on one Share while the Stock Unit is outstanding. Dividend equivalents may be converted into additional Stock Units. Settlement of dividend equivalents may be made in the form of cash, in the form of Shares, or in a combination of both. Prior to distribution, any dividend equivalents which are not paid shall be subject to the same conditions

and restrictions (including without limitation, any forfeiture conditions) as the Stock Units to which they attach.

(e) Form and Time of Settlement of Stock Units

Settlement of vested Stock Units may be made in the form of (a) cash, (b) Shares or (c) any combination of both, as determined by the Committee. The actual number of Stock Units eligible for settlement may be larger or smaller than the number included in the original Award, based on predetermined performance factors. Methods of converting Stock Units into cash may include (without limitation) a method based on the average Fair Market Value of Shares over a series of trading days. A Stock Unit Award Agreement may provide that vested Stock Units may be settled in a lump sum or in installments. A Stock Unit Award Agreement may provide that the distribution may occur or commence when all vesting conditions applicable to the Stock Units have been satisfied or have lapsed, or it may be deferred to any later date, subject to compliance with Section 409A of the Code. The amount of a deferred distribution may be increased by an interest factor or by dividend equivalents. Until an Award of Stock Units is settled, the number of such Stock Units shall be subject to adjustment pursuant to Section 12.

(f) Death of Participant

Any Stock Unit Award that becomes payable after the Participant's death shall be distributed to the Participant's beneficiary or beneficiaries. Each recipient of a Stock Unit Award under the Plan shall designate one or more beneficiaries for this purpose by filing the prescribed form with the Company. A beneficiary designation may be changed by filing the prescribed form with the Company at any time before the Participant's death. If no beneficiary was designated or if no designated beneficiary survives the Participant, then any Stock Units Award that becomes payable after the Participant's death shall be distributed to the Participant's estate.

(g) Creditors' Rights

A holder of Stock Units shall have no rights other than those of a general creditor of the Company. Stock Units represent an unfunded and unsecured obligation of the Company, subject to the terms and conditions of the applicable Stock Unit Award Agreement.

SECTION 11.CASH-BASED AWARDS

The Committee may, in its sole discretion, grant Cash-Based Awards to any Participant in such number or amount and upon such terms, and subject to such conditions, as the Committee shall determine at the time of grant and specify in an applicable Award Agreement. The Committee shall determine the maximum duration of the Cash-Based Award, the amount of cash which may be payable pursuant to the Cash-Based Award, the conditions upon which the Cash-Based Award shall become vested or payable, and such other provisions as the Committee shall determine. Each Cash-Based Award shall specify a cash-denominated payment amount, formula or payment ranges as determined by the Committee. Payment, if any, with respect to a Cash-

Based Award shall be made in accordance with the terms of the Award and may be made in cash or in shares of Stock, as the Committee determines.

SECTION 12.ADJUSTMENT OF SHARES.

(a) Adjustments

In the event of a subdivision of the outstanding Stock, a declaration of a dividend payable in Shares, a declaration of a dividend payable in a form other than Shares in an amount that has a material effect on the price of Shares, a combination or consolidation of the outstanding Stock (by reclassification or otherwise) into a lesser number of Shares, a recapitalization, a spin-off or a similar occurrence, the Committee shall make appropriate and equitable adjustments in:

(i) The number of Shares available for future Awards under Section 5;

(ii) The limitations set forth in Sections 5(a) and (b) and Section 19;

(iii) The number of Shares covered by each outstanding Award; and

(iv) The Exercise Price under each outstanding Option and SAR.

(b) Dissolution or Liquidation

To the extent not previously exercised or settled, Options, SARs and Stock Units shall terminate immediately prior to the dissolution or liquidation of the Company.

(c) Reorganizations

In the event that the Company is a party to a merger or other reorganization, outstanding Awards shall be subject to the agreement of merger or reorganization. Subject to compliance with Section 409A of the Code, such agreement shall provide for:

(i) The continuation of the outstanding Awards by the Company, if the Company is a surviving corporation;

(ii) The assumption of the outstanding Awards by the surviving corporation or its parent or subsidiary;

(iii) The substitution by the surviving corporation or its parent or subsidiary of its own awards for the outstanding Awards;

(iv) Immediate vesting, exercisability and settlement of outstanding Awards followed by the cancellation of such Awards upon or immediately prior to the effectiveness of such transaction; or

(v) Settlement of the intrinsic value of the outstanding Awards (whether or not then vested or exercisable) in cash or cash equivalents or equity (including cash or equity subject to deferred vesting and delivery consistent with the vesting restrictions applicable to such Awards or the underlying Shares) followed by the cancellation of such Awards (and, for the avoidance of doubt, if as of the date of the occurrence of the transaction the Committee determines in good faith that no amount would have been attained upon the exercise of such Award or realization of the Participant's rights, then such Award may be terminated by the Company without payment); in each case without the Participant's consent. Any acceleration of payment of an amount that is subject to section 409A of the Code will be delayed, if necessary, until the earliest time that such payment would be permissible under Section 409A without triggering any additional taxes applicable under Section 409A.

The Company will have no obligation to treat all Awards, all Awards held by a Participant, or all Awards of the same type, similarly.

(d) Reservation of Rights

Except as provided in this Section 12, a Participant shall have no rights by reason of any subdivision or consolidation of shares of stock of any class, the payment of any dividend or any other increase or decrease in the number of shares of stock of any class. Any issue by the Company of shares of stock of any class, or securities convertible into shares of stock of any class, shall not affect, and no adjustment by reason thereof shall be made with respect to, the number or Exercise Price of Shares subject to an Award. The grant of an Award pursuant to the Plan shall not affect in any way the right or power of the Company to make adjustments, reclassifications, reorganizations or changes of its capital or business structure, to merge or consolidate or to dissolve, liquidate, sell or transfer all or any part of its business or assets. In the event of any change affecting the Shares or the Exercise Price of Shares subject to an Award, including a merger or other reorganization, for reasons of administrative convenience, the Company in its sole discretion may refuse to permit the exercise of any Award during a period of up to thirty (30) days prior to the occurrence of such event.

SECTION 13.DEFERRAL OF AWARDS.

(a) Committee Powers

Subject to compliance with Section 409A of the Code, the Committee (in its sole discretion) may permit or require a Participant to:

(i) Have cash that otherwise would be paid to such Participant as a result of the exercise of a SAR or the settlement of Stock Units credited to a deferred compensation account established for such Participant by the Committee as an entry on the Company's books;

(ii) Have Shares that otherwise would be delivered to such Participant as a result of the exercise of an Option or SAR converted into an equal number of Stock Units; or

(iii) Have Shares that otherwise would be delivered to such Participant as a result of the exercise of an Option or SAR or the settlement of Stock Units converted into amounts credited to a deferred compensation account established for such Participant by the Committee as an entry on the Company's books. Such amounts shall be determined by reference to the Fair Market Value of such Shares as of the date when they otherwise would have been delivered to such Participant.

(b) General Rules

A deferred compensation account established under this Section 13 may be credited with interest or other forms of investment return, as determined by the Committee. A Participant for whom such an account is established shall have no rights other than those of a general creditor of the Company. Such an account shall represent an unfunded and unsecured obligation of the Company and shall be subject to the terms and conditions of the applicable agreement between such Participant and the Company. If the deferral or conversion of Awards is permitted or required, the Committee (in its sole discretion) may establish rules, procedures and forms pertaining to such Awards, including (without limitation) the settlement of deferred compensation accounts established under this Section 13.

SECTION 14.AWARDS UNDER OTHER PLANS.

The Company may grant awards under other plans or programs. Such awards may be settled in the form of Shares issued under this Plan. Such Shares shall be treated for all purposes under the Plan like Shares issued in settlement of Stock Units and shall, when issued, reduce the number of Shares available under Section 5.

SECTION 15.INDUCEMENT AWARDS POOL.

(a) Inducement Share Reserve

An additional pool of Shares (the "*Inducement Shares*") are reserved under this Plan to be used exclusively for the grant of Awards in compliance with New York Stock Exchange Rule 303A.08 (the "*Inducement Awards*"). The pool of Inducement Shares shall not exceed in the aggregate (a) 475,000 Shares ("*Share-based Inducement Awards*"), plus (b) $116,225,000, with the specific number of Shares within such $116,225,000 limit based on (i) the Fair Market Value of a Share on the vesting date of the Inducement Shares or, if so provided in the Award Agreement, the volume-weighted average trading price of a Share for up to 60 days immediately preceding such vesting date, (ii) the Fair Market Value of a Share on the date of grant of an Inducement Award, or (iii) any other value of a Share in the applicable agreement setting forth an Inducement Award including but not limited to an asset acquisition agreement, a stock acquisition agreement, a merger agreement, or any similar agreement ("*Value-based*

Inducement Awards"). The number of Inducement Shares shall be subject to adjustment pursuant to Section 12, as applicable. For purposes of clarity, the Inducement Shares that may be awarded are in addition to and shall not reduce the number of Shares reserved under Section 5(a) for Awards other than Inducement Awards. The Shares underlying any Inducement Awards that are forfeited, canceled, held back upon exercise of an Inducement Award or settlement of an Inducement Award to cover the exercise price or tax withholding, reacquired by the Company prior to vesting, settled without the issuance of Shares or otherwise terminated (other than by exercise) shall be added back to the number of Inducement Shares available for grant under this Section 15 based on the number of Shares forfeited, canceled, held back, reacquired, settled without the issuance of Shares or otherwise terminated (other than by exercise) for Share-based Inducement Awards and based on vesting date Fair Market Value of the Inducement Shares returning to the Plan or other valuation method set forth in the Award Agreement for Value-based Inducement Awards, but shall not affect the number of Shares available for Awards under Section 5(a).

(b) Inducement Award Rules

Notwithstanding anything to the contrary in this Plan, an Inducement Award may be granted only to an Employee as an inducement material to the individual's entering into employment with the Company or an Affiliate within the meaning of New York Stock Exchange Rule 303A.08 and only if such individual has not previously been an Employee or has experienced a bona fide period of interruption of employment with the Company and its Affiliates prior to grant of the Inducement Award. In addition, notwithstanding any other provision of the Plan to the contrary, all such Inducement Awards must be granted by the Committee. No Inducement Award may be an ISO.

SECTION 16.PAYMENT OF DIRECTOR'S FEES IN SECURITIES.

(a) Effective Date

No provision of this Section 16 shall be effective unless and until the Board has determined to implement such provision.

(b) Elections to Receive NSOs, SARs, Restricted Shares or Stock Units

An Outside Director may elect to receive his or her annual retainer payments and/or meeting fees from the Company in the form of cash, NSOs, SARs, Restricted Shares or Stock Units, or a combination thereof, as determined by the Board. Alternatively, the Board may mandate payment in any of such alternative forms. Such NSOs, SARs, Restricted Shares and Stock Units shall be issued under the Plan. An election under this Section 16 shall be filed with the Company on the prescribed form.

(c) Number and Terms of NSOs, SARs, Restricted Shares or Stock Units

The number of NSOs, SARs, Restricted Shares or Stock Units to be granted to Outside Directors in lieu of annual retainers and meeting fees that would otherwise be paid in

cash shall be calculated in a manner determined by the Board. The terms of such NSOs, SARs, Restricted Shares or Stock Units shall also be determined by the Board.

SECTION 17.LEGAL AND REGULATORY REQUIREMENTS.

Shares shall not be issued under the Plan unless the issuance and delivery of such Shares complies with (or is exempt from) all applicable requirements of law, including (without limitation) the Securities Act of 1933, as amended, the rules and regulations promulgated thereunder, state securities laws and regulations and the regulations of any stock exchange on which the Company's securities may then be listed, and the Company has obtained the approval or favorable ruling from any governmental agency which the Company determines is necessary or advisable. The Company shall not be liable to a Participant or other persons as to: (a) the non-issuance or sale of Shares as to which the Company has not obtained from any regulatory body having jurisdiction the authority deemed by the Company's counsel to be necessary to the lawful issuance and sale of any Shares under the Plan; and (b) any tax consequences expected, but not realized, by any Participant or other person due to the receipt, exercise or settlement of any Award granted under the Plan.

SECTION 18.TAXES.

(a) Withholding Taxes

To the extent required by applicable federal, state, local or foreign law, a Participant or his or her successor shall make arrangements satisfactory to the Company for the satisfaction of any withholding tax obligations that arise in connection with the Plan. The Company shall not be required to issue any Shares or make any cash payment under the Plan until such obligations are satisfied.

(b) Share Withholding

The Committee may permit a Participant to satisfy all or part of his or her withholding or income tax obligations by having the Company withhold all or a portion of any Shares that otherwise would be issued to him or her or by surrendering all or a portion of any Shares that he or she previously acquired. Such Shares shall be valued at their Fair Market Value on the date when taxes otherwise would be withheld in cash. In no event may a Participant have Shares withheld that would otherwise be issued to him or her in excess of the number necessary to satisfy the minimum legally required tax withholding.

(c) Section 409A

Each Award that provides for "nonqualified deferred compensation" within the meaning of Section 409A of the Code shall be subject to such additional rules and requirements as specified by the Committee from time to time in order to comply with Section 409A. If any amount under such an Award is payable upon a "separation from service" (within the meaning of Section 409A) to a Participant who is then considered a "specified employee" (within the meaning of Section 409A), then no such payment shall be made prior to the date that is the

earlier of (i) six months and one day after the Participant's separation from service, or (ii) the Participant's death, but only to the extent such delay is necessary to prevent such payment from being subject to interest, penalties and/or additional tax imposed pursuant to Section 409A. In addition, the settlement of any such Award may not be accelerated except to the extent permitted by Section 409A.

SECTION 19.TRANSFERABILITY.

Unless the agreement evidencing an Award (or an amendment thereto authorized by the Committee) expressly provides otherwise, no Award granted under this Plan, nor any interest in such Award, may be sold, assigned, conveyed, gifted, pledged, hypothecated or otherwise transferred in any manner (prior to the vesting and lapse of any and all restrictions applicable to Shares issued under such Award), other than by will or the laws of descent and distribution; provided, however, that an ISO may be transferred or assigned only to the extent consistent with Section 422 of the Code. Any purported assignment, transfer or encumbrance in violation of this Section 19 shall be void and unenforceable against the Company.

SECTION 20.PERFORMANCE BASED AWARDS.

The number of Shares or other benefits granted, issued, retainable and/or vested under an Award may be made subject to the attainment of performance goals. The Committee may utilize any performance criteria selected by it in its sole discretion to establish performance goals; provided, however, that in the case of any Performance Based Award, the following conditions shall apply:

(i) The amount potentially available under a Performance Based Award shall be subject to the attainment of pre-established, objective performance goals relating to a specified period of service including but not limited to any of the following performance criteria: (a) cash flow, (b) earnings per share, (c) earnings before interest, taxes and amortization, (d) return on equity, (e) total stockholder return, (f) share price performance, (g) return on capital, (h) return on assets or net assets, (i) revenue, (j) income or net income, (k) operating income or net operating income, (l) operating profit or net operating profit, (m) operating margin or profit margin, (n) return on operating revenue, (o) return on invested capital, (p) market segment shares, (q) costs, (r) expenses, (s) initiation or completion of research activities, (t) initiation or completion of development programs, (u) other milestones with respect to research activities or development programs, (v) regulatory body approval, (w) implementation or completion of critical projects, (x) commercial milestones or (z) other milestones with respect to the growth of the Company's business or the development or commercialization of any product or service ("*Qualifying Performance Criteria*"), any of which may be measured either individually, alternatively or in any combination, applied to either the Company as a whole or to a business unit or Subsidiary, either individually, alternatively or in any combination, and measured either annually or cumulatively over

a period of years, on an absolute basis or relative to a pre-established target, to previous years' results or to a designated comparison group or index, in each case as specified by the Committee in the Award;

(ii) The Committee may appropriately adjust the method of evaluating performance under a Qualifying Performance Criteria for a performance period as follows: (i) to exclude asset write-downs, (ii) to exclude litigation or claim judgments or settlements, (iii) to exclude the effect of changes in tax law, accounting principles or other such laws or provisions affecting reported results, (iv) to exclude accruals for reorganization and restructuring programs, (v) to exclude any extraordinary nonrecurring items as determined under generally accepted accounting principles and/or described in managements' discussion and analysis of financial condition and results of operations appearing in the Company's annual report to stockholders for the applicable year, (vi) to exclude the dilutive effects of acquisitions or joint ventures, (vii) to assume that any business divested by the Company achieved performance objectives at targeted levels during the balance of a performance period following such divestiture, (viii) to exclude the effect of any change in the outstanding shares of common stock of the Company by reason of any stock dividend or split, stock repurchase, reorganization, recapitalization, merger, consolidation, spin-off, combination or exchange of shares or other similar corporate change, or any distributions to common stockholders other than regular cash dividends, (ix) to exclude the effects of stock based compensation and the award of bonuses under the Company's bonus plans; and (x) to exclude costs incurred in connection with potential acquisitions or divestitures that are required to be expensed under generally accepted accounting principles;

(iii) The Committee shall establish the applicable performance goals in writing and an objective method for determining the Award earned by a Participant if the goals are attained, while the outcome is substantially uncertain, and shall determine and certify in writing, for each Participant, the extent to which the performance goals have been met prior to payment or vesting of the Award; and

(iv) The maximum aggregate number of Shares that may be subject to Performance Based Awards granted to a Participant in any calendar year (other than Inducement Awards) is 2,000,000 Shares, and no more than two times this amount in the first year of employment (subject to adjustment under Section 12), and the maximum aggregate amount of cash that may be payable to a Participant under Performance Based Awards granted to a Participant in any calendar year that are Cash-Based Awards is $10,000,000.

SECTION 21.NO EMPLOYMENT RIGHTS.

No provision of the Plan, nor any Award granted under the Plan, shall be construed to give any person any right to become, to be treated as, or to remain an Employee or Consultant. The Company and its Subsidiaries reserve the right to terminate any person's Service at any time and for any reason, with or without notice.

SECTION 22.DURATION AND AMENDMENTS.

(a) Term of the Plan

The Plan, as set forth herein, shall come into existence on the date of its adoption by the Board of Directors; provided, however, that no Award may be granted hereunder prior to the Effective Date. The Board of Directors may suspend or terminate the Plan at any time. No ISOs may be granted after the tenth anniversary of the earlier of (i) the date the Plan is adopted by the Board of Directors, or (ii) the date the Plan is approved the stockholders of the Company.

(b) Right to Amend the Plan

The Board of Directors may amend the Plan at any time and from time to time. Rights and obligations under any Award granted before amendment of the Plan shall not be materially impaired by such amendment, except with consent of the Participant. An amendment of the Plan shall be subject to the approval of the Company's stockholders only to the extent required by applicable laws, regulations or rules.

(c) Effect of Termination

No Awards shall be granted under the Plan after the termination thereof. The termination of the Plan shall not affect Awards previously granted under the Plan.

SECTION 23.EXECUTION.

To record the amendment and restatement of the Plan by the Board of Directors, the Company has caused its authorized officer to execute the same.

INVITAE CORPORATION

By /s/ Thomas Brida
Name : Thomas Brida
Title: General Counsel and Secretary

Exhibit 31.1

PRINCIPAL EXECUTIVE OFFICER'S CERTIFICATION PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Sean E. George, certify that:

1. I have reviewed this quarterly report on Form 10-Q of Invitae Corporation for the period ended March 31, 2021;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a—15(e) and 15d—15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Dated: May 4, 2021

/s/ Sean E. George, Ph.D.
Sean E. George, Ph.D.
Chief Executive Officer and Director
(Principal Executive Officer)

Exhibit 31.2

PRINCIPAL FINANCIAL OFFICER'S CERTIFICATION PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Shelly D. Guyer, certify that:

1. I have reviewed this quarterly report on Form 10-Q of Invitae Corporation for the period ended March 31, 2021;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a—15(e) and 15d—15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
   a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
   b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
   c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
   d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
   a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
   b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Dated: May 4, 2021

/s/ Shelly D. Guyer
Shelly D. Guyer
Chief Financial Officer
(Principal Financial Officer)

Exhibit 32.1

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350,
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the quarterly report of Invitae Corporation (the "Company") on Form 10-Q for the period ended March 31, 2021, as filed with the Securities and Exchange Commission on the date hereof (the "Report"), the undersigned officer of the Company certifies, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that, to such officer's knowledge:

(1) The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Dated: May 4, 2021

/s/ Sean E. George, Ph.D.
Sean E. George, Ph.D.
Chief Executive Officer and Director
(Principal Executive Officer)

Exhibit 32.2

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350,
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the quarterly report of Invitae Corporation (the "Company") on Form 10-Q for the period ended March 31, 2021, as filed with the Securities and Exchange Commission on the date hereof (the "Report"), the undersigned officer of the Company certifies, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that, to such officer's knowledge:

(1) The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Dated: May 4, 2021

/s/ Shelly D. Guyer
Shelly D. Guyer
Chief Financial Officer
(Principal Financial Officer)